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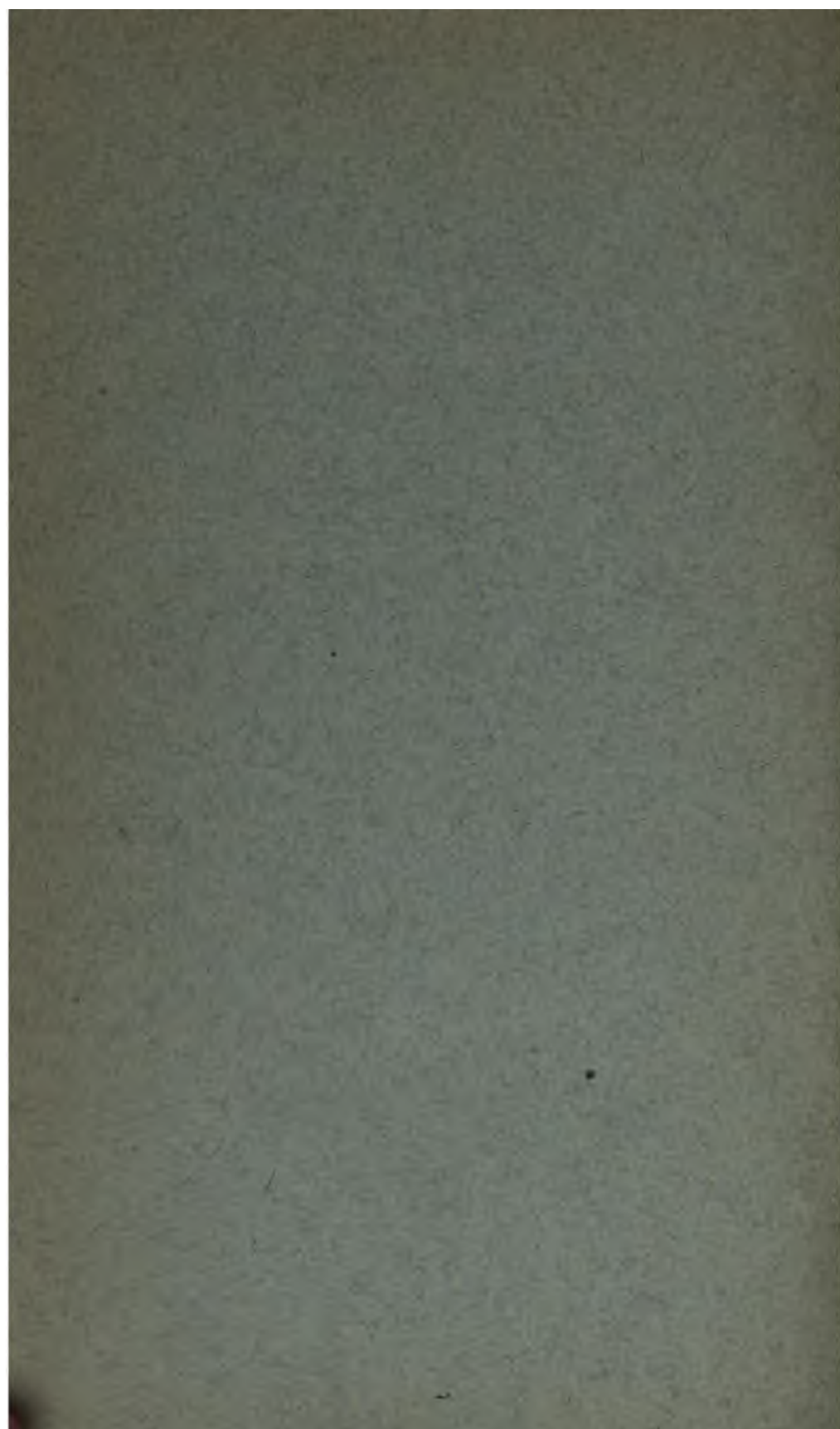
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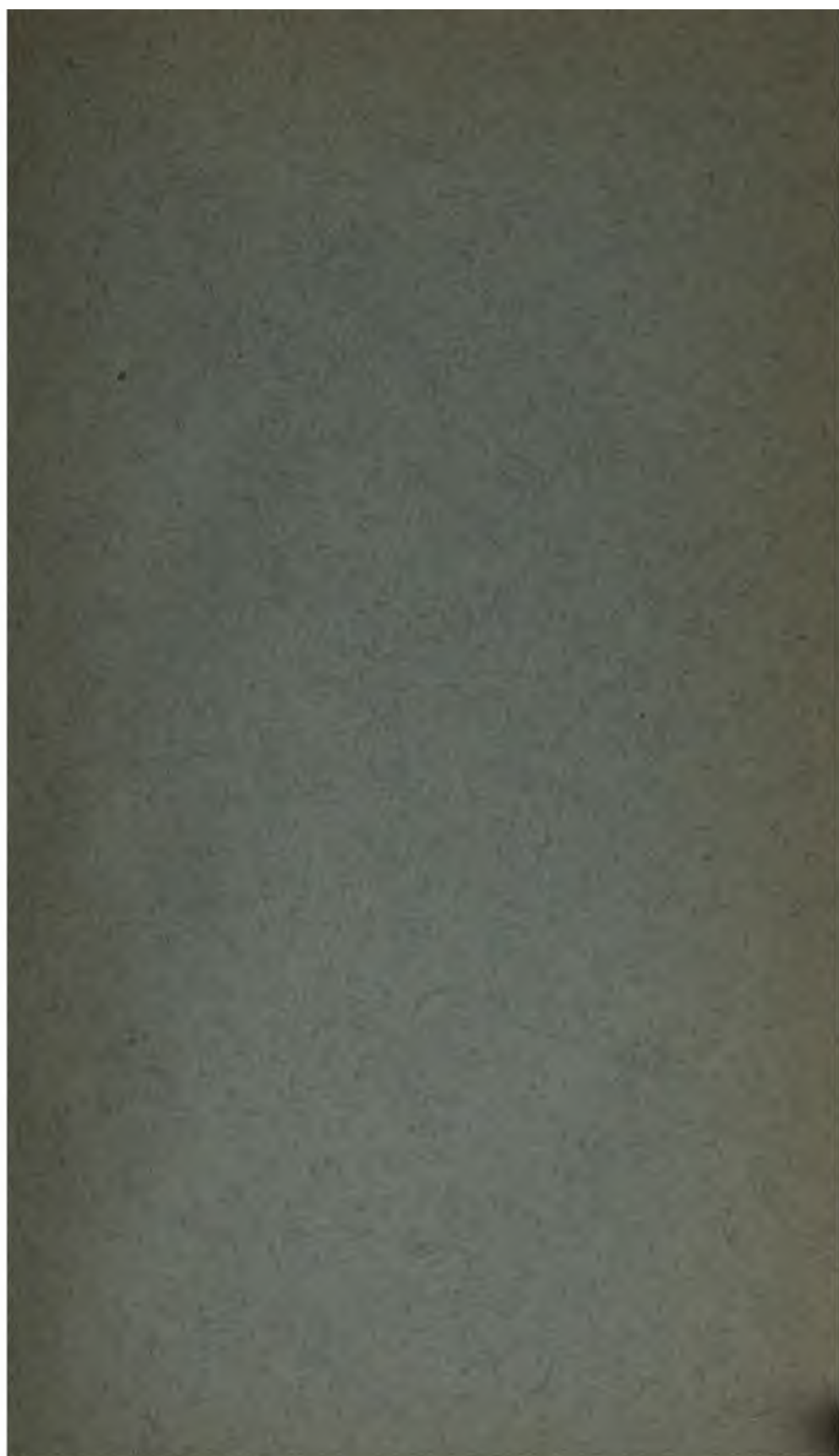
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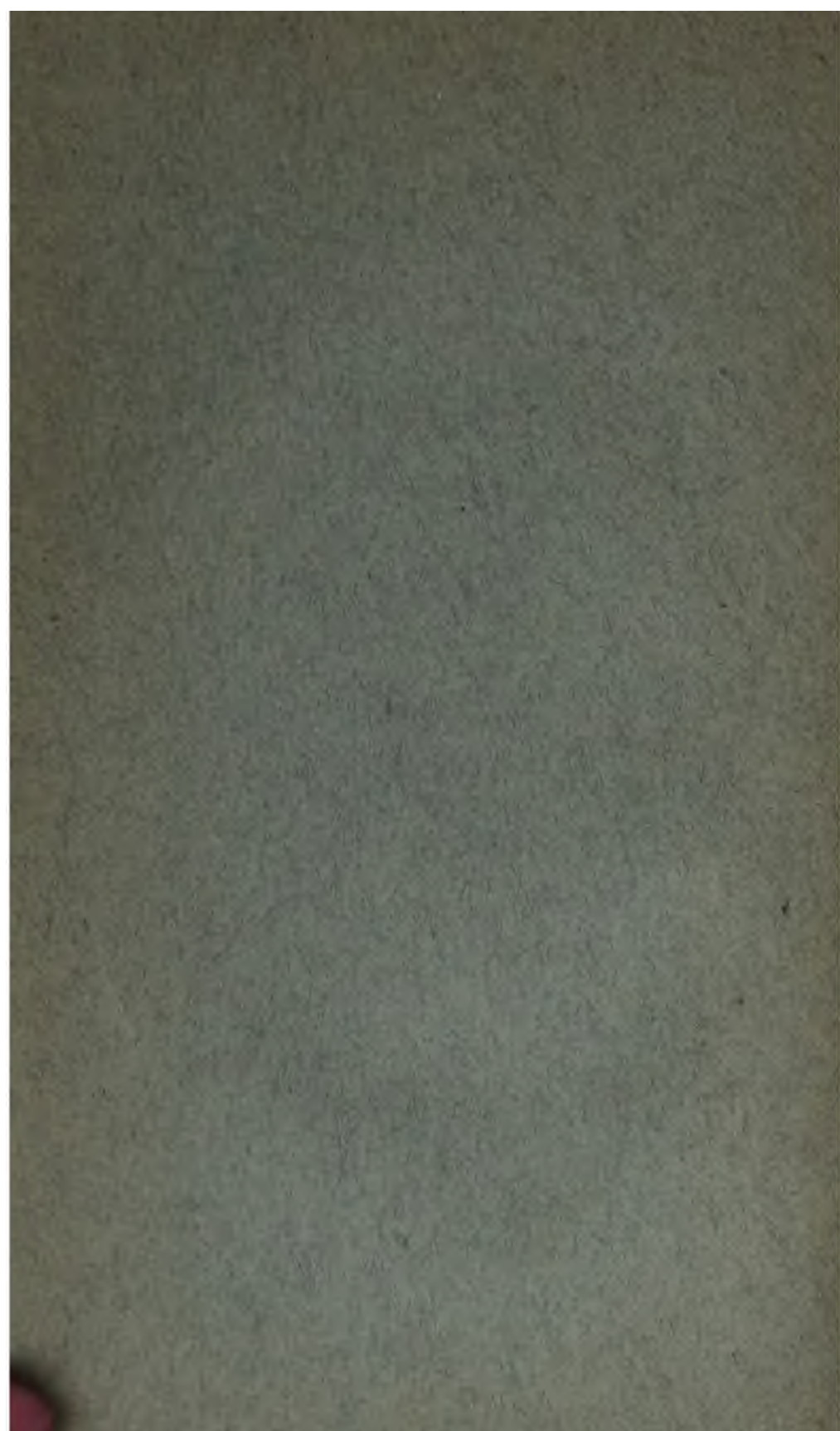
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APPALACHIA

THE JOURNAL OF

THE APPALACHIAN MOUNTAIN CLUB

VOL. III

1882—1884



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APPALACHIA.

VOL. III.

BOSTON, JUNE, 1882.

No. 1.

The Annual Address of the President.

BY CHARLES E. FAY.

Read January 11, 1882.

I CAN, perhaps, in no way more aptly introduce the few considerations with which I shall attempt to comply with the requirement of our By-Laws, than by quoting a most pertinent passage from the conclusion of a very interesting work by an English author, entitled, "Traces of History in the Names of Places." Profoundly impressed with the contradictory attributes of the intangible things that so long had been the subject of his thought, he exclaims : —

"*Voces et præterea nihil* are these names ; but they outlast races, tribes, families, orders, and thrones. Yet each place-name is but the result of a fortuitous concurrence of causes. To establish an appellation as the name of a place required at first the concurrence of many independent wills about a mere matter of taste ; and its persistence has depended in a like manner upon the agreement of succeeding generations, over whom the namer and his contemporaries have no power. In all its history the name is beyond the reach of law, while all the probabilities are against the vitality of a thing so unsubstantial and evanescent. Yet place-names survive. *Stat nominis umbra* ; and the shadow stretches down the long vista of the ages, even when the substance which casts it, the event or the person, eludes the search of historian and antiquary."

These words, which so well sum up the conclusions at which every one must arrive who is led to investigate the sanction of geographical names, have seemed to me in other respects sufficiently suggestive to form the text to a discussion of some of the considerations which should move those who, like the members of this Club, especially in their associated capacity, are in a position to exert a salutary influence upon the future local nomenclature of our country. The subject may be presumed to possess a special interest here, as being one of several to which your attention has frequently been called, even if it has not hitherto been accorded a very prominent place among these.

I shall naturally discriminate in geographical names between those of the chief natural features and those of man's creation. The saying, "God made the country and man made the town," carries a profound significance here also. The names we give our political divisions — our states, our cities, our suburbs, our streets — possess an interest for us different in degree and kind from that which centres in the names of our mountains, rivers, lakes, seas, and headlands. From earliest childhood to old age, never do we lack assurances that the former are purely the work of our fellow-men, whether in the opening of a new thoroughfare, the springing into being of a new suburb, the sudden expansion of a city by some sudden influx of population, or the extension of national boundaries by purchase or by conquest. These are man's doings. Let him for convenience call them anything good taste may dictate. Not but that we are interested in them, proud of them ; but they are to us, after all, not created but made. They lack the one essential thing which gives to certain of these natural features their interest and even grandeur, — an almost personal individuality.

And this individuality early impresses us. Revert to your own youthful days, and I doubt not your memories will duplicate my own. I recall my first acquaintances — nay, friends — in Nature's companionable throng. The river along which I strolled with my mates in vacation visits ; whose sandy bank, drilled by the swallows, rose sheer from beds of cool, moist clay that held but for a moment the print of our bared feet ; to whose fickle care we trusted ourselves hardily, knowing still

that it demanded its one or two annual victims; swirling gently by in its summer eddies, dashing wildly on with its affrighted burden of logs and upturned trees in the wondrously widened bed of its spring freshets,—it was, if anything, surely but a trifle less than a being endowed with soul and will and sense. I would not have thanked the scholar who should have told me that its name signified, in the original tongue, “Swift-water-place,” that it was extremely doubtful if the appellation applied at first to more than a particular locality lower down on its course. To me it was the Merrimack, and that word summed up and gave utterance to the multitude of impressions that scores of rambles had called into existence.

And my first mountain,—so far away, my love for it was little short of platonic! How it thrilled me when, driving or walking by the roads that climbed the hills, I saw it lifting its misty form above the northwestern horizon. How I looked out for it as I approached some well-known spot where the sinking away of the intervening hills allowed a brief view! What satisfaction if the clear atmosphere had favored the seeming tryst! What disappointment if a malicious haze had come between! It had a being. Its rich name gave it grand expression. I would not have thanked the ruthless seer who should have lifted the veil of the future, to show me myself inspired with a passionless love of hard facts, engaged in trying to bring daylight out of or into a bewildering discussion as to whether it or another was the “true, original, and only Kearsarge.” To me it was all of this. What cared I whether the name meant “Notch-pointed mountain of pines,” or something else, or nothing save itself?

And this brings me face to face with what seems to me the prime essential of desirable names. Being applied to something which has an individuality of its own, the name should first of all be individual. To be completely so, it should be suggestive merely of its object. Contrary, perhaps, to a commonly received opinion, I must maintain that that is the ideal name which awakens no vivid impression, calls up no image other than, or at least apart from, the natural object to which it is applied. No, I do not even care, as I gaze upon the monarch

of our New England peaks, to have my soul kindle with reviving impressions of the virtues of that incomparable patriot, to say nothing of having pass before my mental vision the various presentments of his benignant venerated form, from that which decorated the cover of my childhood's geography to the martial equestrian figure on the Public Garden. Such emotions, such pictures, are excellent in their place, but their place is not here. It is only because Washington, as a name, has, by long familiar usage, become to me so thoroughly identified with this mountain as not to awaken these irrelevant ideas, that I am by no means inclined to find fault with it. It should be with proper names as with a strain of harmony. An enlightened taste, assisted by a profound investigation of the psychology of music, has set the seal of impertinence upon any effort to render by this art distinct pictures, counterfeited sounds. By nature vague, mysteriously and intangibly suggestive, it is an art more delicate than painting, and too ideal for mimicry. And we are fortunate when the place-name awakens and combines only the vague harmonies of varied but correlated impressions and experiences won in the spot it characterizes. Still more so when, in addition to this, the name itself is rich, strong, and melodious.

In general, we in America have been and are at a great disadvantage in our nomenclature. This is the New World, and time is almost indispensable for the creation of the ideal name. The foreign names which we so much admire, even those of Great Britain, have had to ripen. Given originally as descriptive or commemorative, it has required the flight of centuries, with, perchance, the supplanting of the primitive language by a conquering race, to eliminate the original idea and reduce them to simply self-suggestive appellations.

When I have considered the enormous demand upon the discoverers and colonists of a new continent in giving names to its multitude of natural features,—a demand which is constantly maintained by the rapid push of civilization into the yet remaining wilds, to say nothing of the scores of new names for minor features demanded by the curious interest of modern tourists,—I do not wonder that we find, as the result of their efforts, a most heterogeneous catalogue. A single fact

has helped redeem what otherwise would have been for the most part a dreary waste of loans, cheap epithets, and metaphors,—the fact that there were aboriginal inhabitants whose languages remain as unfamiliar to most of us as the tongues of the men who named Helvellyn and the Himalayas. These Indian names, whether originally applied to what they now characterize, or happily misapplied to something which otherwise would have fared worse, are almost the only ones of all our American place-names which satisfy the requirement of our ideal. And this is why a name of Indian origin should generally be accorded the preference when it is desirable to bestow an appellation on a natural feature worthy of the expenditure. Alas that our store of them is so limited !

You have already anticipated my thought, that, except these aboriginal names, the ideal name is of necessity almost beyond our reach. To borrow well-sounding names from abroad is a method scarcely to be tolerated ; for, besides being a confession of poverty, it militates against the requirement of individuality. Attempts to construct such names will most likely meet with failure. The “ concurrence of many independent wills ” will not probably wait on these manufactured titles. Witness the fate of the appellation invented for Mount Nancy. Mr. Sweetser says : “ This peak received the name of *Mount Amorisgelu* some twenty years since, in commemoration of the unfortunate maiden who died at its foot. The word is compounded of two Latin words, meaning the Frost of Love, and is accented on the third syllable, in order to resemble an Indian name.” Certainly “ *Amorisgelu*,”—late-born Latin hung with wampum,—is, phonetically considered, a success, remarkably varied, round, penetrating, and mellow ; but it smells of the lamp, we see the seams, it is a fraud, and homespun “ Nancy ” holds the field.

Accepting, then, the conclusion that we cannot have the best, save to a limited extent, it becomes a question of choosing those names which shall most nearly approximate to this standard, and especially those which give promise of becoming most speedily suggestive simply of their object. For mountains, possessing to such a marked degree the element of personality, I question whether personal names may not stand in

the second place in the order of desirability. If Indian names, as Chocorua, Passaconaway, Osceola, there is hardly a doubt of it; and, as may be inferred from what was said concerning Washington, there are certain facts of our nature in the light of which mere surnames of our own language are not without their advantages. Idealized, if men of power or genius, forgotten, if mere village worthies or the fameless proprietors of the soil, the personality of the man who bore the name becomes effaced by that of the peak to which it has long been applied, as the earlier picture in a dissolving view appears in ever diminishing proportion in that which succeeds. Thanks to the transitoriness of human fame, they are most of them in a single generation well started on the course at the end of which they will be found transformed into ideal names. Who stops to-day to think of the useful citizen of the Granite State but for whose existence and labors we never should speak of "grand old Carrigain"?

I confess that it becomes an argument against the application of personal names, when all the peaks of a group are named for men of a single class, as in our so-called "Presidential Range." This name is of itself its sufficient condemnation. A class has been created, and a new difficulty thrown in the way of our forgetting that the original bearers of the names were prominent statesmen. For monumental purposes this is a desideratum; on purely nomenclative grounds, a misfortune. To me, Field, Willey, Carrigain, Hancock, Osceola, Tecumseh, Fisher, and Welch, which, according to Professor Hitchcock, continue and complete the great range, are a more satisfactory set of names for their very heterogeneousness.

But what shall we say when the next step is taken, which leads entirely off from the sublime? The most symmetrical of our grander New Hampshire peaks, when studied closely, is seen to have several subordinate summits, culminations of its lateral ridges. As subjects of the topographer's science, or merely as themes of conversation among their frequenters, they must needs be characterized by some special designations. One would have supposed that a consideration of their subordinate value would have suggested the inappropriateness of en-

dowing them with titles co-ordinate with that of their principal ; and doubtless so it would have been, if the initiative had been left to sober science. But the wittiest of all the poetic intellects that ever found their well-earned recreation among these scenes gives, in a thoughtless moment, the name of "John Quincy Adams" to one of the most pronounced. O fatal precedent ! For now, instead of a company of demigods grouped round a Jove, we have a confidential interview of representatives of an illustrious Massachusetts name, the living with the dead. Where will it end ? for already, besides the main peak, Adams,—named for our country's second president,— "John Quincy," "Sam," and "Charles Francis" are now known to the initiated. Can they not be persuaded to bury their secret, and devise a new way of naming these rocky crags, at once appropriate and unambiguous ?

And what, indeed, shall we say when the selectmen of Franconia, justly elated at the remarkable "concurrence of independent wills" which sets the seal of almost certain success upon their essay to make of a poorly named mountain within their borders a monument to our newly-martyred President,—unrestrained by the consideration that a place-name is "beyond the reach of law," and the thought that they who have done well should avoid the opportunity of doing worse,—announce that an unnamed summit on the same range with Lafayette and Lincoln, and adjacent to the newly christened Mount Garfield, shall henceforth be known as "Elizabeth Thompson Mountain" ? By no means would I seem to imply any disrespect for the generous-hearted woman whose name by their act, not my word, is given an inconsiderate publicity ; but I cannot refrain from saying that, viewed purely from the ground of the desirable in nomenclature, it violates every requirement,—by its intrinsic inappropriateness, its cumbrous length, its lack of melody, and, most of all, by its promise of inflexible obstinacy in resisting, were it adopted, the mitigating influences of time, and remaining suggestive of nothing else than its strangely honored namesake. Surely, under the circumstances, a prediction as to its fate is unnecessary.

I have dwelt disproportionately long upon this portion of my subject, but its special relation to our immediate field of work will perhaps be my sufficient excuse.

Next to our mountains, it is doubtless our rivers in whose names we feel the deepest interest. To arrive at some conclusions as to what we have to hope for and to strive towards for the future, let us consider some of the results of past efforts in the naming of our American streams.

Mr. Flavell Edmunds, from whom I quoted in the beginning, lays it down as a rule that "the principal rivers and hills of any country retain the names given to them by the aborigines; while the less conspicuous elevations and smaller streams either lose their original names or are not named until, by subsequent immigration, the country has been more densely settled." At the very outset of a study of our American river-names, we are confronted by a quite well-founded theory which seems contrary to Mr. Edmunds's first statement, though in a way confirming the principle. I refer to the belief, held by some who have given close study to the subject, that the Indians seldom if ever gave geographical names to anything but localities. Thus the Rev. Edward Ballard, in a paper entitled "The Indian Mode of Applying Names," published in the Collections of the New Hampshire Historical Society (Vol. VIII. 1860), says that "this opinion gains support from the fact that the Indians of this State (New Hampshire) never gave names to rivers. . . . They gave no one name to the whole length of the stream, but only to places important to them for hunting and fishing." He adds, farther: "The same remark will apply to the other rivers in New England and, it is believed, generally to the regions and rivers of our whole country."

The existence of Indian names connected with our rivers then becomes explicable on the theory of a frequently occurring and natural misunderstanding. Be this as it may, it is chiefly in the earlier settled portions of our country that we find names of Indian origin attached to our streams, particularly in the portions discovered or settled by the English and Dutch, — to a much less degree in those explored or colonized by the French and Spanish. Notice, first, the Atlantic slope. With some dozen exceptions, and perhaps half of these among the most important streams, the rivers debouching into the Atlantic Ocean from Passamaquoddy Bay to Florida have

names derived from Indian sources. One can easily count fifty within these limits. Of the exceptions, three of the most prominent have personal names, — the Hudson, Delaware, and James. The far more frequent exceptions in the portions originally settled by the French and Spanish, exhibit in their nomenclature to a marked degree the influence of their religion. Saints, holidays, the sacred things of their Church, were commemorated by these piously-minded pioneers. The great rivers of the central portion of our land, the Mississippi with its larger tributaries, for the most part bear names of aboriginal etymology. On the Pacific slope such names are rare. The later settled of our States east of the Mississippi witness a rapid decrease in the number of them, and in the newly explored portions they almost become conspicuous by their absence. Of 155 streams west of the 100th meridian, counted in a good school geography, but 13 bore Indian names. This is not, of course, an exhaustive list. Personal names are equally few, but the field is occupied chiefly by descriptive names of every shade of unsuggestiveness and poor taste. White, Vermilion, Red, Blue, Bad, Crooked, Mouse, Snake (quite a favorite), Prairie Dog, Bear, Grey Bull, Porcupine Tail, Mussel-shell, Big Knife, Powder, Cannon Ball, Bad Land, Red Willow, Long Pine, Tongue, Heart, Republican, Canadian (down in Indian Territory), Purgatory, and (pardon me the mention!) Dirty Devil will give an idea of the infinite richness and variety of the stream-names in the more recently explored sections of the Union.

It is evident that the tendency in our river nomenclature has been retrograde as regards dignity and taste. Indeed the list would seem to present as good a criterion from which to judge of the moral worth of their namers as of their taste. The earlier names bear witness to a recognition of the rights and co-humanity of the red-men, the occupants found in possession. The earlier-given personal names, when not of saints, are those of men of the world worthy of the honor done them, — the navigator, the governor, the king. Even the descriptive names in the States settled before increasing wealth and education had divided our people into widely separated classes whose tastes react but little on each other, have in them some-

thing of appropriateness and dignity. But probably the civilized — and surely the uncivilized — world would fail to produce a parallel to the depths of coarseness and triviality to which the geographical nomenclature of the Far West has descended. The streams show it less than localities. They who have given these names must have been men with as little poetry in their souls as respect in their hearts for the original possessors of the soil, — men of brutal wit, rough manners, and rude speech, the heroes of Bret Harte and Joaquin Miller. However much we may be opposed on principle to the changing of well-established names, we cannot but foster the hope that the maps of the future will witness a gradual elimination of these depraved and tasteless appellations.

Inasmuch as the minor features of natural scenery are most likely to receive descriptive names, and as it is to them that our Club is most likely to be called upon to apply designations, it may be well for us to devote a few moments to a consideration of them as a class.

Nothing is more evident than that greater harm has been done our local nomenclature in the past by these than by any others, and from them the most is to be apprehended for the future. Their dangerousness arises from the fact that with them the margin of indifference is very narrow. When not good, they are likely to be positively bad. Happily for those who are compelled to use them constantly, there is nothing so bad that we may not become accustomed to it; “we first endure, then pity, then embrace.”

They may be divided into two classes, the realistic and the imaginative. The former are suggested by some characteristic attribute or by some physical resemblance, real or fancied. When appropriate they form very satisfactory names, but are likely to degenerate as a class towards the commonplace and even irrelevant. Of the imaginative class are our truly poetic names, such as Storm King, the Garden of the Gods, the Sibyl's Cave, the Glen of Shadows;¹ but also, since imagination is not monopolized by the cultivated and scholarly, some not so pretty, as illustrated by the large amount of property

¹ Given the past season by a party of Appalachians to a beautiful spot on the King's Ravine path.

in natural scenery mortgaged to his Satanic Majesty. We could have hoped that the growth of good taste in the older settled portions of our land, to say nothing of a decrease of the realizing sense of his personal omnipresence, had rendered this infernal nomenclature antiquated and obsolescent; but it appears that he is still to pay with our place-names, for as recently as 1880, Prof. Hitchcock announced, at our field meeting at Fabyan's, the discovery of a new cave near Maidstone Lake, Vermont, which had been named Hellsgate Cave. I have no doubt of a millenium in the near future that will abrogate this dismal category, and hope that our Club may do something in the way of hastening its coming.

Nor should we forget that dangers attend even the higher class of imaginative names. First, lest they be too far removed from the sympathies of the less cultivated classes, whose concurrence is equally desirable in fixing names,—a risk most likely to be run when classic learning makes itself prominent. Again, as the popular imagination tends to err in the direction of coarseness, so here there is ever present the opposite danger of landing in the "hyperpoetical" and inane. While among the best possible names, when by their special appropriateness they tend to fulfil the requirement of merely relevant suggestiveness, they are the hardest to secure, on account of the perfect sense of the appropriate and rare taste which is demanded. If our members were all poets, our President still might tremble if he had to appoint a committee with full powers to apply names of this class.

I may refer in this connection to certain names which do not fall strictly under the head of descriptive names, those which commemorate not persons but events. Sometimes they bear in themselves their easy explanation, like the Cape of Good Hope, but too often are handing down to posterity enigmatical hints of trivial circumstances which are like Grattiano's reasons: "You shall seek all day ere you find them, and when you have them they are not worth the search." Often they are the secret of some party of boon companions. With all our spirit of good fellowship, shall we not as a Club cast our influence against these trivial names, beginning the good work with "Burnt Hat Ridge."

But I do not forget that my subject is almost endless, and human patience scarcely so. Permit me, however, before closing, clearly to set forth what seems to me the Club's opportunity for exercising a wholesome influence on American geographical nomenclature.

It does not lie in its power to give an unprejudiced opinion in sharp controversies, or in assuming the initiative in changes where change is not urgently demanded. The positions we have assumed in such cases are wise, and calculated to increase our influence in the future. But our fullest measure of usefulness will be attained by keeping in mind the truths conveyed in the words with which I began, and by acting in accordance with them; by remembering that as the fiat of a monarch and the decrees of all the legislative bodies of the world cannot add one word to a language, so there is no power able to insure the currency and perpetuity of a local name. But, as this "depends upon the concurrence of many independent wills about a mere matter of taste," it behooves us as a Club to exercise such discretion in conciliating good-will and respect, and to manifest such taste in any possible tentatives, as will insure a prestige to all suggestions that may originate with us. That high scientific authority and the tourist public should turn to us for advice or aid, is evidence of a respect which should be jealously guarded. Yet even more, than from any positive activity, may be expected from the negative and conservative power that we may exercise. As success depends upon concurrence, it will seriously hinder the obtaining of an undesirable name or uncalled-for change, when a society having a numerous and respectable constituency, its discretion recognized by the public press, issuing authoritative maps and able to exert an influence over other cartographers, — when such a society simply refuses to concur. Our power for good in this direction may not at present cover a very large geographical area, but who can set the limit of its possible extension in the years to come?

At present we are not sufficiently organized for the best efficiency in this field. As the time approaches when we are to publish the careful results of our topographical work, which will contain many features not usually laid down on maps and

as yet unnamed, we shall need to proceed with great care. It may be even desirable to have a carefully selected committee—organized possibly under the department of Art—whose special duty it shall be to consider any names to which the Club is supposed to lend its sanction and authority before presenting them for adoption by the Society.

In again laying down the office of President, I congratulate the Club on the measure of prosperity which it enjoys at the opening of the seventh year of its existence, emphasizing the fact that no better warrant is needed of its usefulness, and right to be, than the steady increase of its numbers and influence,—a growth that as yet has not suffered even a temporary check. I congratulate it that the presidential office passes to the guardianship of one whose scientific standing and tried executive talents will soon make amends for any deficiencies of the year that is past.

A Visit to Milan, as Delegate to the Fourteenth Annual Congress of the Italian Alpine Club, 1881.

BY J. B. HENCK, JR.

Read May 12, 1882.

THE Italian Alpine Club was organized in Turin in 1863, and from the first had been in the habit of having social dinners for the purpose of bringing the members together for the promotion of acquaintance and pleasure. With its subsequent extension throughout Italy, and the great increase in its membership which has resulted, these dinners have assumed greater importance as the occasion for bringing together members of the Club from different parts of the country; and, dating from 1872, they have taken the title and character of an annual Congress, which aims to unite the interests of all the various local sections, and to give each the benefit of intercourse and acquaintance with the others. There are at present 34 sections scattered throughout Italy, with a total membership of

about 4000. Nearly all of these sections were represented at the Congress, there being gathered in all about 300 members of the Club, besides representatives of the London Alpine Club, the Swiss Alpine Club, the Austrian Tourists' Club, the *Associació d'Excursions Catalana* of Barcelona, and the Appalachian Mountain Club of Boston.

The meetings of the Congress and business headquarters were in the rooms of the Polytechnic Institution in the Piazza Cavour, and here on Monday, August 29, those who were to take part in the Congress presented themselves and entered their names. Each was given a little book prepared for the occasion, on the first page of which was a blank for inscribing his name as a member of the Congress, with the signatures of the President and Secretary of the Milanese Section. The book also contained tables for computing heights by the aneroid barometer, some notes on the latter, and a table of the heights of the principal summits of the Alps. There were also given pamphlets containing a historical sketch of the Club and a catalogue of its exhibit at the National Industrial Exhibition then being held in Milan. In the evening the rooms were open for an informal rendezvous of such as might like to come in, and a business meeting was held.

On Tuesday, August 30, a most delightful excursion was made to the *Buco del Piombo*. It was a beautiful day, and a merry party of about 200 ladies and gentlemen took the train from Milan at about 7 A. M. for Erba, arriving about 8. From here a walk of two or three miles, through the town and by easy lanes and paths up the mountain side, brought the party to the *Buco*. This is a large cave, opening with a nearly semicircular arch about 200 feet wide by perhaps 150 feet high. The floor is very irregular and the roof falls rapidly to the back, where the cave is continued into the mountain in the form of a hole, which at the entrance is perhaps 15 or 20 feet wide and the same in height, narrowing very gradually as it goes in, until, at the distance of 800 feet or so, it becomes too small for a man to pass further. How much farther it extends no one knows, but there is a tradition that it passes completely through the mountain, coming out near the Pliny Villa on the Lake of Como. The name *Buco*, meaning a hole, is thus justified ;

but the Piombo, or lead, appears to be a myth, as it seems to be generally doubted whether any lead was ever found there. At the entrance to the outer cave are remains of old masonry, the place having once been, according to popular tradition, a fortified stronghold of a band of robbers.

A stream of delicious mountain-spring water, flowing out of the cave, adds to its attractions as a picnic ground; although my Italian companions for the most part looked on with some astonishment to see me drinking this water in preference to the beverages which they had thought the only proper thing to provide as an accompaniment to their lunch,—very few of them following my example and none responding with any show of interest to my praise of the water. After lunch photographs of the party were taken, and some explored the inner cave with torches. The walk back was as delightful as the ascent, affording views all the way of the valley and neighboring mountains. After a short rest and refreshments at the station, the party returned by train to Milan, which was reached about 4:30 P. M.

On Wednesday, August 31, a couple of hours in the morning were assigned to a visit to the exhibit of mountaineering apparatus, made by the Club, at the National Industrial Exhibition, some of the objects in which I hope to describe in a separate paper.

At noon the principal meeting of the Congress for hearing papers was called to order by Signor Vigoni, President of the Milanese Section, who, after a few words of welcome to members from a distance, introduced Signor Quintino Sella, formerly Minister of Finance of Italy, the President of the Club, as chairman of the meeting. Signor Sella then addressed the meeting, making remarks complimentary to the industrious city of Milan, to its mayor who was present, and to the hospitality of the Milanese Section and reviewing the growth and work of the Club. He also mentioned the recent sad accident on the Dufourspitze, by which a member of the Club (Signor Marinelli) perished with his two guides in the attempt to reach the highest peak of Monte Rosa. The mayor of Milan, Count Giulio Belinzaghi, responded briefly on behalf of the city, and Mr. Budden, an English gentleman residing in Florence and President of the Florentine Section, Signor Guglielmazzi, Presi-

dent of the Section of Domo d' Ossola, and others spoke of the loss of Signor Marinelli.

Letters were read from various notables, among them one from the King's chamberlain expressing His Majesty's sympathy with the objects of the Club; and the loyalty of the alpinists was attested at the mention of the King's name by all rising to their feet and shouting "Viva il Re" amidst applause and general enthusiasm.

The meeting then passed to the order of the day, which included the following papers:—

1. Professor Brugnatelli.—On a proposed new formula for the measurement of heights by the barometer.

2. Callisto Villa.—A new analytical manual of Alpine flora for the use of alpinists.

3. C. Fanchiotti.—Account of the school of arts, trades and small industries established in the Verbanese mountains by the Section of Verbano, and a proposition for the establishment of other similar schools.

4. C. Fanchiotti.—Account of the work and results of a committee on the planting of mountain slopes, appointed by the Section of Verbano.

5. Signor Curo.—Presentation of some proofs of a panorama from the Corno Stella, published under direction of the Section of Bergamo.

It was then voted to hold the next Congress at Biella, and the meeting adjourned.

In the evening a social dinner was given, attended by about 250 members and delegates, including two ladies, the Countesses Palazzi-Lavaggi and Gazzone di Valmacca, members of the Section of Turin. The dinner was accompanied by music, and the Royal March was called for several times and always received with universal enthusiasm and shouts of "Viva il Re," "Viva la Casa di Savoia;" but when the band in a spirit of impartiality struck up Garibaldi's March, it was met with groans and hisses and cries for "la Marcia Reale," so that the band had to give it up and change its tune. After dinner there were speeches and healths and toasts of all sorts. The company did not forget however that an early start was to be made in the morning, and accordingly broke up in good season.

The good weather which we had had thus far was, however, at an end. A heavy thunder shower had come up during the dinner, and although it had ceased raining before we separated, yet the promise for the morrow was very doubtful.

Thursday morning, September 1, in spite of a heavy rain with no signs of clearing, about 130 of the 150 who had entered their names for the grand excursion were on hand at the station at 6:30 A. M., and took the special train which was to carry us to Como. The railway company presented each member of the party with a very useful little guide of the region reached by its lines, with time-tables, etc., which was a very handy companion for our trip. In spite of the rain the party was in excellent spirits, and the journey of two hours to Como passed quickly and pleasantly. At one of the towns on the way a band had turned out to greet the party with music as the train passed through, an evidence of friendly feeling towards the Club which was everywhere manifest. At Como the local section had provided pleasant quarters for our accommodation during the two hours and a half we had to wait there. Many of the party, however, in spite of the rain, occupied the time in looking about the city,—visiting the old Roman remains, the cathedral, museum, statue of Volta, etc.

At 11 o'clock, although the rain showed no sign of stopping, the party, led by a band of music, formed a somewhat irregular procession and marched down to the landing, where a special steamer was waiting to take them up the lake. The rain continued almost without ceasing, and the clouds hung low over the surrounding mountains; but the spirits of the party were not to be damped, and they made the boat ring with their shouts, varying the programme by endeavoring by various demonstrations to extort some response from each of the towns and villas on the shore in passing. No stops were made until the party landed at 1 o'clock at Varenna, a town on the east bank of the lake just above the junction of its two arms. The rain had now nearly ceased, although the clouds were still heavy and threatening, and we had occasional showers all the afternoon and night.

A walk of two hours brought us to Esino, a little mountain village where we were to pass the night. The way was by a

mountain road, climbing gradually up one side of a narrow valley until it reached a bold promontory projecting into the valley, upon which a part of the village was built. A few of the party had hired donkeys and ridden up, and many others had piled whatever luggage they had into the baskets of the women porters, of whom there were plenty in waiting, so as to walk light. I, however, had little to carry, and preferred to carry that myself. The weather was by no means warm and the party were all more or less wet, and in the whole village there was probably not a fire large enough to warm more than one hand at a time. The rest of the day was spent in arranging lodgings for the party, and after a pleasant dinner together at the little hotel the party soon scattered to such shelter as they had been able to find. I, as an honored guest, had been provided with a very pleasant room to myself; but most of the party had to take shelter in the houses of the peasants, and even, in some cases, to sleep on the hay in the barns, for the little place was fairly inundated by so large a party.

About 3 o'clock Friday morning I heard sounds of people up and about, and on dressing and going out I found the party discussing the weather and the chances for the day. It was finally decided to start on the ascent of the Grigna, which was the object of our trip, and take our chances of the weather improving. So after a cup of coffee we set out about 4 o'clock for the mountain.

The Lake of Como is about 200 metres above the sea, and Esino about 800. At a height of about 2000 metres the Milanese Section had built a substantial stone camp, which was to be inaugurated on this occasion; and here, after about three hours' easy climbing by a good bridle path, we halted for breakfast. The weather by this time showed signs of clearing, and at 8 o'clock we set out for the summit, with good hope that the clouds still hanging about it would lift. Two hours of good work, over broken rock and snow, brought us at 10 o'clock to the top, 2400 metres above the sea; but the weather was still against us. With the exception of a few glimpses through breaks in the clouds on the way up, we were obliged to turn back without seeing anything of the view.

We had, however, enough to repay us for our trouble in the beautiful play of light through the clouds upon the bare gray rocks about us. I have never seen anything equal to the delicate shadings of soft grays and browns which those ragged, barren rocks exhibited, forming, with the drifting masses of white clouds, scenes which seemed natural only to dreamland.

After waiting as long as seemed worth while, in hope of the clouds lifting, we started down, reaching the camp in about an hour. Here we had a little lunch and, after resting, returned to Esino. On the way down I diverged from the path to a little eminence on one of the ridges and was rewarded by a most exquisite view under the clouds, through a ravine, to the lake, the coloring being such as only Italian skies can give; and the weather brightening made the rest of the descent rich in gems of scenery such as we seldom get in our less brilliant atmosphere.

We arrived at Esino in rather straggling order, but all were in good season for dinner at 6 o'clock, which was pleasantly served in the open air. In the evening the promontory was illuminated, several bonfires were kindled on the surrounding hills, and there was music and dancing on the green.

When I rose next morning, Saturday, most of the party had already taken their departure, and after breakfast I set out for Varenna. The walk down, that beautiful morning, was very different from the walk up on Thursday. The winding road brought one at every turn to a new view of the lake and the mountains around and beyond, forming a succession of most charming pictures.

After rest and lunch at Varenna I spent the afternoon in a trip by steamer up the lake and back to Como, whence I took a week's run into Switzerland before returning to Milan.

So passed a meeting which I shall always remember as one of the most delightful experiences of my life, and for which I have to thank my friends of the Appalachian Mountain Club, who did me the honor to send me as their representative. And let me add the hope that our Club, should the occasion present itself, will not be behindhand in returning the kind hospitality and generous attention with which "L'Americano" was received and made at home among their brother alpinists of Italy.

The Little Mountains East of the Catskills.

By WILLIAM MORRIS DAVIS.

Read May 12, 1882.

DURING a recent visit to Catskill, we were told that eighty thousand strangers passed through that town last summer to find rest and recreation in the tributary country to the west. Perhaps a few of these visitors may have a dormant interest in geology that needs but a little touch to awaken it into activity; perhaps some who have not yet visited this attractive region may care to look below its surface when they go. I think that such persons should find some pleasure in studying the varied structure and form of the little limestone mountains in the valley, as well as in looking at the great hills to which the name of the Catskill Mountains has been given. The structural difference between the two is that between magnificent monotony and minute variety. The one is a great wall painted old red and dull green; the other is like a miniature, where every stroke is individual and full of meaning. I have no desire to detract from the just popularity of the Catskills, but I do wish to call attention to their modest and neglected little neighbors. The first do not owe their interest to the way in which they are built up, for they are made of essentially flat sandy layers from bottom to top;¹ their beauty is the result of their wearing away unevenly, and the valleys are finer than the great broad hills between them. The second have a most complicated structure as well as a charmingly picturesque surface, and in tracing out their continual changes one encounters problems of great variety and beauty.

The country of the Little Mountains trends somewhat east of north in a narrow belt, about two miles across, with its eastern margin one to three miles west of the Hudson near Catskill Village. The roads from Catskill to Palenville and to Leeds both cross it on their way westward, and the Palenville Rail-

¹ The faint folds made out by Sherwood, under Hall's direction, can scarcely be detected without instrumental aid, and are quite beyond ordinary vacation discovery.

road, now in construction, will give its passengers some delightful views as it passes the worn limestone folds, where they are deeply cut by the Catskill,¹ in marked contrast to the more open country east and west. But it is only by the traveller on foot that the real attraction of the country can be seen. Let us suppose that he arrives at Catskill in the afternoon, as we did, with an hour or two of daylight for a preliminary stroll. Just west of the town, beyond the stream and to the left of the mountain road, there is a knob of rock standing a little above the high-terrace level of the valley. From the summit, besides the fine view of the eastern face of the Catskills, one may see the easternmost range of the Little Mountains, a mile distant, rising one or two hundred feet over the terrace plain. It is generally surmounted by pines and cedars, but, directly west of the point of view, these are cleared away where the limestone is worked in French's quarry. That will be the first point in to-morrow's walk.

This side of the ridge the country is generally flat. It is the old Hudson flood plain, or level of submergence, smoothed off with blue clays capped with sand. Most of the pre-glacial rock-ridges here are buried beneath this modern covering, but occasionally the rocks rise and show their summits a little above the plain, and on one of these we stand. If the terrace clays were stripped off, an old, nearly extinct mountain surface would be found below. It has a more varied development east of the Hudson, but just here is made only of shales and sandstones compressed into a variety of contortions, generally sharply bent, so that the sides of the folds are often parallel. The average dip of the strata is from forty to seventy degrees eastward. Good examples of their distortions may be seen in the railroad cut between the landing and the town, and on the south bank of the Catskill just before it enters the Hudson. This riverside belt is for several reasons of less interest than the Little Mountains beyond. It is monotonous in composition; gray and greenish muddy and sandy shales make up its entire mass, and are all so much alike that different outcrops of the same beds cannot be identified. Its exact structure and the

¹ Catskill is the village; the Catskill, the stream; and the Catskills, the mountains.

thickness of its rocks must long, if not always, remain undetermined. It has very few fossils; we found none in the many outcrops examined. Its rocks belong to the Hudson River group, and their disturbance closed the Lower Silurian era.

It is well to make an early start the next morning for French's quarry. Eight o'clock is not too early; six is much better in summer, so as to allow a good rest at noon and give time for collecting fossils and drawing profiles and sections. The entire day can then be well spent in crossing the two-mile belt of Little Mountains; it is not great in quantity, but very varied in quality.

On approaching the quarry ridge, it is best to leave the oblique course of the road and turn across the fields square with the trend of the rocks. In the short distance from the terrace level to the summit, six groups or subdivisions can be recognized by their composition, structure, and fossils, a rare variety for so small a space. Their identification with rocks of the same date elsewhere is aided by reference to Dana's *Manual of Geology*, or, for more detailed description, to Mather's *Geology of the First District of New York* (1843). As we are to learn them here so as to recognize their outcrops elsewhere, they must be looked at carefully.

First, the harder layers of the Hudson River group standing on end, forming little ridges,—gray or brown sandstone or sandy shales without fossils; thickness very great but unknown, as the bottom layers are not seen here.

Second, the Waterlime, a fine-grained, even, thin-bedded, light-colored limestone, dipping steep to the west. It weathers whitish. Some of its layers are fossiliferous, a *Leperditia* and a *Tentaculite* being the most characteristic forms. Its thickness is about seventy feet.¹

Third, the Lower *Pentamerus* Limestone, a hard, blue rock, in irregular knotted layers, often containing blue chert. Fossils are not rare, but when seen it is often difficult to break them out. We found *Pentamerus galeatus*, *Atrypa reticularis*, *Rhynchonella mutabilis*, and others. The lower strata are hard, and form ridges or cliffs at their outcrop, with the Waterlime ap-

¹ The descriptions of these subdivisions of the Lower Helderberg group are summarized from observations at many points in this district.

pearing just beneath. The upper third is softer and is often concealed in little valleys. Where exposed, the beaks of a *Pentamerus* are found weathered loose in the soil. Its thickness is about eighty feet, and here it dips 70–50° west.

Fourth, the Catskill Shaly Limestone, a bastard limestone, dull dark blue where freshly broken, weathering brown or gray; even-bedded and often thin-splitting. In spite of its apparent easy weathering, it resists erosion effectively, and usually stands up in a ridge or bench. Its fossils are numerous; *Spirifer macropleura* and *perlamellosa*, *Hemipronites radiata*, *Strophomena rugosa*, *Avicula communis*, and many others. The tails of a trilobite (*Dalmanites*) are not uncommon. Its thickness is perhaps one hundred feet, and its dip here 40–20° to the west.

Fifth, the Encrinal Limestone; hard, coarse crystalline in texture, often of reddish tinge, and in places with dull green partings between its heavy layers. Fossils plenty, but generally broken; single rings of crinoid stems are most characteristic. Some of the layers show a cross-bedded structure on the weathered joints exposed by quarrying; this is rather uncommon in limestone. The strata here are about horizontal.

Sixth, the Upper *Pentamerus* Limestone at the top of the quarry, a hard, blue, crystalline limestone, thick-bedded and often, like the preceding, composed largely of shells, but preserving them in better condition. The characteristic form is *Pentamerus pseudo-galeatus*. A *Spirifer*, an *Orthis*, and a *Rhynchonella* are also commonly seen. The strata lie flat where first met. As there is no soft layer between numbers five and six, they are not separated in the form of the surface, but aid each other in ridge-making. We seldom, therefore, attempted to distinguish one from the other. Their combined thickness, as determined elsewhere, is about one hundred and twenty feet.

These limestones are all subdivisions of the Lower Helderberg group of the Upper Silurian. They here follow directly after the Hudson River rocks, the strata being parallel in their foldings and, as far as we could discover, all conformable, though they are not so elsewhere. Recalling the series of Silurian deposits, it will be seen that the strata which in Pennsylvania

are found between these sandstones and limestones are here absent. The contact of these layers, therefore, marks a long time unrepresented by deposits at this place, although it sufficed for the accumulation of beds many hundred feet in thickness elsewhere.

With this description one should, by the time he has hammered over all these layers and found their more characteristic fossils, have learned to know them fairly well, so that their appearance at other points may be recognized. In ascending the face of the ridge, it will have been noticed that the dip of the rocks diminishes from 90° on the eastern flank to nothing at the summit, — from vertical to horizontal. This would lead us to suspect that the lower layers decrease their dip after they have plunged headlong underground, so as to turn underneath the flat layers of the ridge summit. We should expect therefore to find them reappearing in reverse order as we descend the western slope, and so they do. Each in its turn comes again to the surface with the same thickness (as we roughly estimated it), the same peculiarities, the same fossils, but now dipping to the east. Evidently then they here form a down-fold or synclinal; but so greatly has erosion modified the original form that the sides of the trough are now worn away below its middle, and it is transformed from a structural valley into an actual mountain. As if to leave no doubt of the internal structure beneath the summit, the Cauterskill has cut through the ridge just north of the quarry, and on descending northward into its valley along the middle line or axis of the synclinal, the strata are found all lying flat, as they turn from their western to their eastern dip, the Hudson River sandstones at the bottom.

Although of small size, this little mountain has all the characters of larger ones of the same construction, such as Nittany and Brush Mountains in Pennsylvania, or Buckthorn Ridge and Rich Mountain in Southwestern Virginia; and it is greatly to be preferred to those for initiatory study, as it is so small that one can run over it and grasp its form and build in half an hour. It is like the easy examples in our arithmetics, that should be studied before venturing among the wilderness of miscellaneous problems where even the teacher is sometimes at fault.

The quarry ridge has but one defect; it is unsymmetrical. The strata do not enter its opposite flanks at equal angles, but are flatter on the west; and hence its eastern slope is short and steep,—its western, long and made up of broad benches and abrupt steps. We shall see, however, that this defect has an important significance.

On reaching the western outcrop of the Lower Pentamerus Limestone, it is best to follow it southward before descending to the valley beyond, and, neglecting a fold of subordinate value that interrupts its direct course, go on a third of a mile to a point where the bench has risen to a high and abrupt cliff over some farmhouses below. It is only about one hundred and fifty feet high, but it is so steep as to be imposing, in a small way, and especially interesting in its relations to the valley and ridge beyond. Climbing down here, the cherty limestone is seen in the cliff-face and, if the exposure be favorable, the Waterlime may be found below it; and, still further down, the Hudson River sandstones crop out of the talus in a few places.

The valley has lost much of its pre-glacial depth by a terrace-filling, corresponding to that of the river belt, and formed at the same time of high water. Crossing this flat, we come on the west to a steep, rocky, wooded ridge, and as we ascend its eastern face we easily recognize again the lower limestones of the series studied at the quarry synclinal, the same as those just left on the other side of the valley, the Waterlime and the Lower Pentamerus; but here they stand nearly vertical. After rising to a moderate height, and before the trees shut out the view, look back and consider the relation of the valley to its enclosing slopes. The old Hudson River rocks occupy its middle. A little to the north of where we crossed they may be seen in the valley bottom, and further on they form a reef over which the Cauterskill falls. On either side, the limestones plunge underground east and west. Restore their former continuity, now interrupted by erosion, and we have an arch, higher in the middle than at the sides, and therefore, as at the quarry, a strong contrast, a complete contradiction, between unworn structure and actual form. The valley is cut down upon the crest of a great arch of rocky layers, reducing what

was meant for an elevation to a depression. As the strata dip away from the north and south centre-line, or axis, of the imaginary arch, we have here an anticlinal valley. Nittany and Brush Valleys in Pennsylvania, and certain high valleys in the Jura Mountains are of the same construction. Like the Quarry Mountain, this valley is defective in having its opposite dips unequal, in being very unsymmetrical; but again this defect leads to an important generalization.

Continuing our way over the ridge, the entire series of limestones is easily identified in proper order; but, from one side to the other, they are close to the vertical. As they are effective in resisting erosion in this position, they retain a considerable elevation above the softer rocks on either side, — the older Hudson River groups on the east, and the newer grits, yet to be described, on the west. In altitude, the ridge is equal to the quarry synclinal, but simpler in structure. All the layers having essentially the same dip, and occurring without repetition in natural order, we may call this a monoclinal ridge. In being of vertical dip it serves poorly as a type of its kind, but a mile further west we shall find another example of more usual form. The same structural name might be applied to any one of the little ridges bordering the synclinal, when considered apart from the mass to which they belong.

At the western side of the ridge, the strata have passed the vertical and dip steep to the east; they are slightly overthrown. A mile further north, beyond the Cauterskill, the same ridge is completely overturned and lies on its back, with an easterly dip of 45 to 70°, the older layers apparently on top, and the newer beneath. Such accidents are very common in mountains of extreme distortion, as the Alps.

On leaving the ridge, the descent for twenty feet is precipitous and mildly difficult, as it should be in little mountains; thence to the foot, down a talus of limestone blocks, and the next outcrop adds a new formation to our list, the grits of the Corniferous period. They are impure limestones, having a plentiful share of fine sand and clay, very fine and uniform in texture, and frequently without any sign of bedding; they split easily enough, but the fissures are not as a rule on the planes of original stratification, but on an imperfectly developed cleav-

age. It is therefore nearly impossible on most outcrops to discover their true dip, and this must be inferred from the position of the adjoining limestones. The only fossil we need mention is the print of a curled seaweed, *Spirophyton caudagalli*; it is well seen at a little waterfall in the valley we have just entered, not far from where its stream joins the Cauterskill to the north. The hard slabs of grit from which the cascade leaps are all marked over with "cock-tails." The stratification of the grits shows much more plainly here than elsewhere.

Returning southward to our section-line, and resuming our westward path, we find the grits occupying a total breadth of about three hundred and fifty feet, and as they are here enclosed between nearly vertical strata on either side, this breadth gives a rough measure of their thickness. On account of the excessive squeezing they have here suffered, the measure is probably too small.

The formation bounding them on the west is a hard, blue limestone, abounding in chert and generally without fossils, known as the Corniferous Limestone. Its layers plunge westward at a high angle, too steep for descent at most points; but occasional breaks in the strata, aided by projecting knobs of chert, give opportunity for climbing down about fifty feet into the valley below. Notice in making the descent that the dip of the limestone decreases. In the stream bed, generally dry, it may be seen horizontal, and directly beyond on the opposite slope, it has changed so as to dip to the east. At some well-exposed points the actual curving of the hard limestone beds may be seen; their radius of curvature at the bottom of the fold is not more than one hundred and fifty feet.

In ascending the gentle slope west of this valley, we follow the limestone layers for a short distance. Their dip is almost the same as the slope of the hillside; and where the soil is washed away, their surface shows the effect of erosion by solution in the rill troughs dissolved out by rain water, and in the widely opened joints. The limestone ends rather abruptly, in some places presenting a wall-like face, straight and even for a hundred feet or more; and directly beneath it, exposed in shallow gullies, lie the grits.

Now look back again. Here is a second valley, but how un-

like the first. Its newest layer, the Corniferous Limestone, occupies the lowest middle line, and the strata rise to either side. As they wear away, they disclose the older grits on the bordering slopes. Here then is a synclinal valley ; structure and form agree. A lime-kiln near by may give it a name. Wyoming Valley in Pennsylvania, holding a long canoe-basin of hard coal, is a famous example of this kind. The upper valleys of the Rhine and of the Rhone in Switzerland have the same structure although there carried to an extreme.

Passing from the limestone on to the grits, we cross over a gently curved summit, and descending on the western slope soon meet the limestone again, now dipping west and increasing its dip as we approach the valley of the Cauterskill. This is then still a fifth type of structural form, — the older rocks on the summit, the newer ones lying on the flanks and dipping away from the axis ; hence an anticlinal mountain, in which structure and form again agree, and the effect of erosion is less of a disguise than in the first two types. Examples of a similar nature are Jack's and Tuscarora Mountains in Pennsylvania. The Front Range of the Rocky Mountains shows the same structure on a large scale, as may be seen where the Pacific Railroad crosses it. The Mont Blanc Range of the Alps is its most exaggerated form. Going northward along the rounded ridge, we come to a deep gap cut square through it by the Cauterskill as it turns east ; and here the anticlinal structure is very apparent on the southern bank of the stream. Returning and going a little way south, we find the summit gradually lowering and the limestone advancing on either flank till it meets over the mountain axis. Here the crown of the Corniferous arch has escaped erosion, and the curve of the hill is covered by a single formation.

The valley of the Cauterskill, into which we descend from the anticlinal ridge, is here cut on the soft layers of the black Marcellus Shale overlying the Corniferous Limestone. Outcrops are rarely seen, as the old preglacial valley is now clogged with a terrace-filling such as we have met elsewhere, and the stream has seldom worn down again to bed rock. We had best go half a mile south to the Mountain Road, and there, a few hundred feet beyond its bridge, the shale is seen lying on the

limestone at the waterside and dipping west. It is seldom fossiliferous, — a black, fine-grained, even-bedded deposit, hard until exposed to the weather, when it splits easily into thin layers and crumbles away. The western side of the valley rises to a considerable height in hills made of hard sandstones and sandy shales; still dipping to the west they are fairly shown in the bed of a stream, up whose valley the road follows on its way to the Catskills and the Clove; but a better section is given three miles farther south where the Cauterskill itself enters the Marcellus Valley from the west at Big Falls. Many of the layers are fossiliferous and some are rich in shells; *Spirifer accuminata* and *mucronata*, *Grammysia bisulcata*, and others announcing them to be of the Hamilton epoch. At the falls, the stream plunges over two hard sandstone layers, each about four feet thick; these rise as they extend east on either side of the cross-gap, and form the determining ridge-line of the high bluffs above named.

Having thus seen the general order of strata within the valley, we can return to our section-line and contrast it with the anticlinal and synclinal valleys already passed. It differs from both in having layers of a westerly dip throughout. On the eastern slope, the Corniferous Limestone turns its back to the valley. On the west it is limited by the outcropping faces of the Hamilton Sandstones, and the depression itself is cut on the intermediate Marcellus Shale. This is therefore a monoclinal valley, in which the strata follow in regular order from one side to the other, without repetition, the soft layers on which the valley is eroded, being enclosed between harder layers below and above.

Finally the bluff¹ of Hamilton Sandstones gives a more ordinary form of monoclinal ridge than that already passed where the strata were vertical. It has the characteristic steeper outcrop face to the east, and gently sloping western back, that enables one to determine with some certainty its structure from its form, even when seen from a distance. The hard layers which determine its summit line dip west at an angle of ten degrees, nearly at right angles to its uppermost and steep-

¹ This is not shown on our map, but appears on the general section from river to mountains.

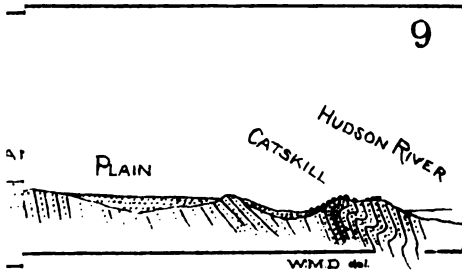
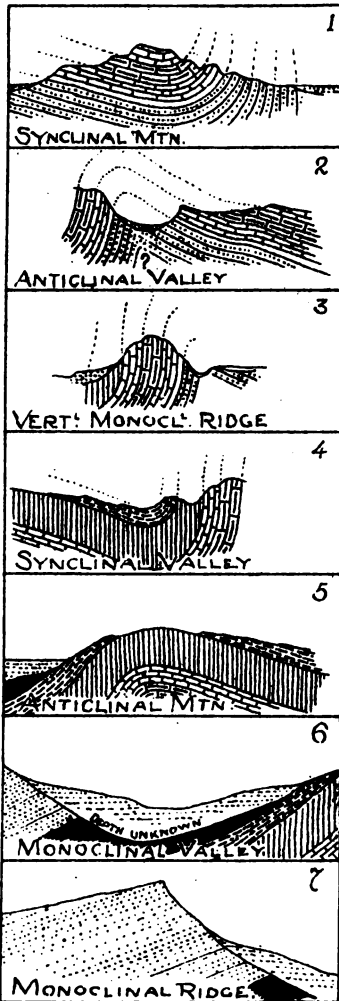
est eastern slope, and a few degrees steeper than its back. Blue Mountain in Pennsylvania and Clinch Mountain in Tennessee are of the same kind.

Farther west than this we need not go. From the Hamilton monoclinical to the foot of the mountains, similar but smaller sandstone ridges alternate with monoclinical valleys cut on shales of decreasing dip, and from the foot of the mountains to their summit, the strata lie very nearly horizontal, one on the other, — a long succession of almost barren flaggy sandstones and shales, alternating with a few conglomerates near the top.

In the very moderate breadth of our Little Mountain belt, we have found examples of the six types of surface form as determined by folded, stratified rocks; both mountains and valleys of monoclinical, anticlinal and synclinal structure. It would be difficult to find elsewhere so compact an epitome of structural stratigraphy — synclinal mountain, anticlinal valley, vertical monoclinical ridge, synclinal valley, anticlinal mountain, monoclinical valley, and sloping monoclinical ridge, following directly one after the other. Every one is shown in characteristic form, both on the surface and in natural cross section, and with well marked individuality in the layers of which it is built. What a misfortune that they cannot be brought home, as the botanist brings his plants.

Attention has already been called to the unsymmetrical form of the folds. This is rendered more apparent by grouping the separate sections into a continuous profile across the belt. It will then be noticed that, in every case, the western side of the anticlinals (or the eastern side of the synclinals) is the steeper. We have then here a good showing of the characteristic feature of Appalachian structure that was pointed out over forty years ago by the Rogers Brothers, a greater or less western overthrowing of the anticlinals. Indeed, these hills are but the dwindling away of the more expanded forms of the Appalachian system farther south. Here, under the Catskills, they are reduced to convenient pocket size for easy study; and no better preparation could be found for a trip in Pennsylvania or Virginia, than is offered among the ridges and valleys of our little limestone mountains.

APPALACHIA Vol. III. PLATE I.
SPECIAL SECTIONS



13

We have thus far considered only the transverse structure of the mountain belt, implying thereby that each fold is indefinitely continued north and south. This is by no means true. Change of form characterizes the ridges and valleys when followed along their trend, as well as across it, but this change is slower. It is caused in two ways. First, the axes of the folds often fail of being horizontal; they dip in one direction or the other. Secondly, the folds fade away or run out. The synclinal axis of French's quarry sinks to the south. As a consequence its opposite sides diverge and the distance between them widens. The capping layer of Upper Pentamerus does not retain its elevation, but descends with the axis, and the widening trough would soon take the form of a deep valley, were it not for the grits which half a mile south are found filling its middle. Conversely, the axis rises to the north, and in that direction all the limestones have been worn away and only Hudson River rocks appear. This is beautifully shown from the northern point of the quarry, where the ridges formed by the eastern outcrops of the harder layers wheel around the end of the mountain in a half circle, and join their fellows on the west.

The axis of the anticlinal valley also rises to the north. The valley, therefore, widens in that direction and rapidly narrows to the south. Standing on the cliff of Lower Pentamerus that encloses it on the east, we may see its head half a mile distant, and walking there we find the opposite walls approach and in succession the several layers bend over and meet one another, wrapping around to the south, as in the synclinal they turned to the north. The highest of the limestones runs underground southward with the descending anticlinal just where the mountain road turns from a southwest to a northwest course, and the arch is not seen distinctly again. The vertical monoclinical ridge ends on the south with the anticlinal of which it forms the western side; but going north it continues beyond the Cauterskill, in variable attitude, for about two miles, when it rolls over and forms the eastern side of a shallow synclinal, well shown in the gorge of the Catskill.

The Corniferous synclinal in the Limekiln Valley is doubt-

32 LITTLE MOUNTAINS EAST OF THE CATSKILLS.

fully identified north of the Cauterskill,¹ but to the south it runs for two miles, nearly reaching Van Luven Lake, where it is represented by some loose straggling blocks of limestone resting upon the grits. The anticlinal ridge next beyond to the west is one of the more constant forms of our belt, but looking closely where the mountain road passes through it down to the Cauterskill, we can discover that there are here really two anticlinals,—the western narrowing and dipping to the south, the eastern to the north,—with their apexes overlapping. The road runs southwest in the little trough between the two.

Most constant of all the features here noted are the Marcellus Valley and the Hamilton Ridge. They continue outside of our recent explorations, and as far beyond as we could see in either direction.

Variety and abruptness of change are thus found to increase from west to east,—another Appalachian character,—as we go from the uniform bluffs of the Hamilton to the sharp, inconstant folds adjoining the confused strata of the Hudson River group. As a whole, the country about us is made up of sheets of rock differing greatly in character, of small thickness compared to their horizontal extent, no longer lying flat as when formed, but folded by an intense lateral thrust so as to occupy less than their original east and west breadth. Moreover, a very considerable share of the original extent of the layers has been slowly worn away, and the remaining parts lie in a more or less fragmental, disconnected condition. The present surface therefore results from a balancing between building up and wearing down, and to the varied combination of these two determinants we owe the continually changing character of the mountain belt.

Travellers often go to a distant land ignorant of its language; they learn but little of its inner life. For the same reason, one who comes to this region without knowing the inflexions of its silent speech cannot learn the lessons it repeats. Study and travel, therefore, must go hand in hand. To those who find their pleasure growing as their knowledge increases, I

¹ The cross-cut of the Cauterskill very probably follows an oblique transverse fault, as the folds do not agree on its two sides.

most earnestly commend a visit to these Little Mountains under the Catskills.

EXPLANATION OF THE PLATE. [I.]

The drawings are based on a map of the town of Catskill, in Beer's Atlas of Green County, N. Y. It is unfortunately not very accurate. The structural features were sketched in on this outline without instrumental measurement beyond what a pocket compass would afford, and while fairly correct, they do not pretend to precision. It is thought however, that no serious error has been made.

The map needs no special explanation.

The block sections show surface and interior in alternate bands, as if deep vertical cuts, about six hundred feet broad and twelve hundred apart, had been opened across the Little Mountain belt. The doubtful points are interrogated (?).

The stereogram shows clearly the steeper slope of the beds on the western side of the anticlinals. Perhaps the central anticlinal should be torn and faulted on its crest to the north.

Sections 1 to 7 illustrate the various forms of hill and valley in order of description in the text. Section 8 shows the general structure of the belt. Section 9 is on smaller scale, and extends from the Hudson to the Catskills, showing the varied structure of the Little Mountains between the terrace covering the broken Hudson River beds on the east, and the repeated ridges and valleys of the Hamilton group to the west, with the mountains beyond.

An Ascent of Pike's Peak, 1879.

BY HENRY L. STEARNS.

Read May 12, 1882.

LEAVING the Manitou House at nine o'clock in the morning of the 12th of June, 1879, I took the road leading south. About a quarter of a mile from the hotel, the road divides. The right-hand branch, leading southwest up the Ute Pass, is the old Leadville road. The left hand road leads southeast to the Iron Ute Spring and the Pike's Peak Trail. On this road, by the side of which runs a roaring mountain stream, is the fountain-head of the Manitou and Colorado Springs Water Works, about half a mile from the Iron Springs.

On reaching the spring I refreshed myself with a draught of its invigorating water, and went on. Here the road crosses a little rustic bridge, and narrows down to the trail, following the right-hand side of a most beautiful cañon, with tall pine trees, scrub-oaks, rocks, and a great profusion of mountain yuccas. These grow two feet high, with narrow leaves, which are very stiff and sharp-pointed, which has given rise to the name Spanish Bayonet. The flower is a very pale straw-color. The ascent begins in this cañon, and I soon heard the stream roaring below me, though not very far, for the trail is not steep here.

About half a mile from the Iron Spring one comes to the toll tent, where a man camps out from the middle of May to the middle of October. His duty is to collect toll from those who ascend the Peak, — twenty-five cents for a man on foot, and one dollar for a man on horseback. This money goes towards keeping the trail in repair.

After leaving the toll tent, I descended a little hill and crossed the stream on a picturesque bridge to the left-hand side of the cañon. Here the ascent begins in earnest, and it proved to be very steep and hard. The trail mounts higher and higher until the sound of the rushing water grows almost inaudible, and one can look down on the tops of tall trees and rough, jagged rocks far below. As I turned a corner, a large rock appeared, which looked as if it was an impassable barrier to my further progress; but on reaching it I found that the trail turned sharply to the left and passed between two huge bowlders, over a very small bridge. Here a little brook, a tributary of the main stream, issues from underneath one of the bowlders, clear as a crystal and very cool. A little cup was placed here for the use of thirsty travellers.

I lingered here a few minutes, not so much to rest as to admire the wondrous beauty and sublimity of the place. The two immense rocks with the little trail between them, the crystal brook gushing out from their feet, and the rustic bridge shaded by tall pine trees, with here and there a scrub-oak and a yucca, formed a scene which could not be forgotten. On one side the mountain wall rose steep above me, and on the other was the deep cañon, with tall, ragged mountains

opposite. This is known as the Naiads' Grotto. I was somewhat loath to leave this place ; but I must be getting on, so, after one more look all round, I continued the ascent. The trail was now a little more rough and precipitous than before. After going some distance further, I came to Sheltered Falls, half-way between Manitou and the Lake House. A large bowlder juts out over the stream, under which the water rushes and falls in a sheet for a distance of about twenty feet, then breaks up into numerous little rapids. It is a most beautiful sight. The trail crosses a bridge at this place, to the right-hand side of the cañon. Standing on the bridge, one looks down the cañon, over the tops of all the trees and some of the mountains, — over Manitou and the Garden of the Gods, and out over the prairie beyond. Cathedral Rock, in the Garden, looked strikingly grand from this point, standing high above everything else there. After enjoying this sublime view for some time, I started on again, and soon reached the Devil's Gap, which is a narrow passage between two immense bowlders, and, underneath, another and still larger one, which looks as if it would tumble over at any moment. The trail descends a little here, and passes through a considerable tract of coarse red gravel. This is on the steep side of the mountain, and is a dreary looking place. Passing this, I came to Rosemma Falls, and Little Minnehaha Falls, not far beyond. Farther on was a group of large round rocks, which are called Pebbles from Pike's Peak. These "pebbles" would not be easy to carry away in one's pocket. The trail now descends for some distance until it comes to the stream. Here the water is so shallow that there is no bridge, and the only crossing, on foot, is by an old dead trunk of a tree which lies across the stream. I sat down on this tree to rest, it being just twelve o'clock.

This is a dark and shady spot, with tall pine trees and cavernous-looking rocks. Indeed a timid person would easily imagine these dark, shadowy places to be the lairs of wild animals, and certainly with reason. When one is alone in such a wild, gloomy spot, there is enough to excite imagination, not to say fear. Though not afraid, I kept a good watch all around while I remained there. Bears, wild-cats, and Rocky Moun-

tain lions are sometimes met on this trail. The "lion" is said to be as large as a small calf. They are quite savage if anything crosses their path, and doubtless if I had met one and attempted to pass him, he would have questioned my right of way. A bear or wild-cat might or might not have run from me. I was most fortunate in not meeting any of these creatures, as, having only a small five-shot revolver, of $\frac{32}{100}$ calibre, I was poorly prepared for them. Mountain wolves are also to be met with on the summit, and often come around the station for any scraps of food that are thrown out. A small badger was the only animal I saw.

After resting and lunching, which occupied half an hour, I started on again, and, passing through more of these dark, wild places, soon came to a grove of yellow birches, all young trees, varying in diameter from one to three inches, and from twelve to fifteen feet in height. They were growing so thickly that it was not possible to get through them, except on the trail. All the old trees had died and fallen, and their white trunks lay thickly scattered on the ground among the young growth. The trail is comparatively level here for nearly a mile — which was a pleasant relief after so much steep climbing — and I walked leisurely along, enjoying the sight of this grove, and was sorry when, at last, I came to the end of it.

Crossing the stream again, this time on stepping-stones, I came to the foot of a very steep, rocky, and desolate hill, which is the last one before reaching the Lake House, and the hardest to climb. There is more dead than living wood here, as it is only one thousand feet below timber line. Huge dead trunks lie thickly strewn over the rocks, looking ghastly enough as they gleam in the sunlight, some of them so gnarled and twisted that they look like gigantic serpents. The silence was really oppressive, and, to break it, I fired my revolver; but the report, echoing round among the mountains, only increased the dreary sense of loneliness. After an hour of hard, painful climbing, stopping every few steps to rest on some old, dead trunk, I reached the top of the hill, and kept on down the other side, by a rough and circuitous trail, to the Lake House, which is just at the foot of the hill, by the side of a beautiful lake which covers about four acres and is thirty feet deep.

This Lake House is a little more than half-way between Manitou and the summit. It is a log-cabin of one story, with a flat roof, and contains six rooms, three of them sleeping-rooms for guests. The telegraph wire, which goes to the signal-station on the summit, is connected with an instrument in the office here, and then connects with the station in Colorado Springs, fifteen miles below. A rough log-shed, occupied by a horse and a donkey (or *burro*), is the only other building, besides the hotel, in this place, which is 10,800 feet above sea-level, 4,676 feet above Manitou, and 3,536 feet below the signal-station at the Peak.

As one approaches the house, the great snow-crowned peak comes into full view, rising majestically, giant among pygmies, with first a growth of tall pine trees, thickly interspersed with dead trunks, some standing and others lying on the ground, reaching about one third of the way up, — then a bare brown space, and lastly the snow, relieved here and there by naked rocks.

Passing the night at the Lake House, where, even at this altitude, mosquitoes and flies exercise their tyranny over the weary traveller, I proceeded on my way early in the morning on horseback. A son of the proprietor accompanied me, to take care of the horse and ride him back. It was four o'clock when we started and the air was cold. How desolate everything looked in the gray morning light. The trail led over the crest of a hill for some distance, then turned to the right, up the rocky side of the mountain and among the trees. The telegraph wire follows this trail, and is fastened to the trees as far as the timber line, — then to rocks, and lastly to short poles secured in the snow by piling stones around their bases.

About half-way up to the timber line we saw the sun rise, and it was a sight which alone was worth this toilsome expedition. It was a most beautiful morning, and as the sun rose it gilded the mountain tops, while the sky overhead was one vast expanse of cloudless azure.

Reaching the snow line — which at this season is about 500 yards beyond the limit of timber growth — at 5-30 A. M., I took leave of my companion and his horse. I watched them until they disappeared among the trees, then commenced the rest of

the ascent on foot. I looked around on the dreary waste of rocks and snow, stretching far above me, with nothing save the telegraph wire to guide my footsteps; while below me was the whole Rocky Mountain Range, the tallest of which I could look down upon. A dread sense of loneliness came over me, and for a moment I was almost overpowered by it. Conquering it, however, I began my ascent. This was by no means easy, on account of the light air, which made respiration so difficult that only the slowest progress was possible.

Concluding that the telegraph wire was erected in the safest places, and knowing that it would be a sure guide, I followed it. The air was cold and the snow was frozen hard, which was fortunate, as otherwise the ascent would have been still more difficult, if not impossible. In some places the snow was from fifteen to twenty feet in depth.

The sky at this altitude is of a most intense blue, much more so than it appears at sea-level, or even at Manitou, 6,124 feet above the sea. It was a most beautiful sight, — perfectly clear, with the exception of one small cloud which hung over the extreme summit of the mountain, completely veiling it. As the sun rose higher, this cloud disappeared.

At last, after three and a half hours toiling over the rocks and snow, I came to the signal-station, which is on the highest point of the summit, 14,336 feet above sea-level. Here the observer, Private J. K. Sweeney, U. S. Signal Corps, gave me a kindly welcome. I was too much exhausted to do anything but sit down before his fire, and soon after, feeling no better, lay down on the bed and staid there nearly all day. It was a great disappointment to me to be so used up, as I could not take such an interest in the instruments and outside scenery as I would otherwise have done.

Towards evening, however, I felt able to take a walk around the summit with Mr. Sweeney. The sky was beautifully clear, and the view magnificent. To the west lay the Snowy Range, 150 miles away, and to the south, the Spanish Peaks, 200 miles, while to the east the vast level prairie stretched away until it met the sky. To the north was the Rocky Mountain Range, — of which Pike's Peak is a part, — with Long's Peak, the next highest eminence, 14,300 feet in height. This is about

as far north of Denver, as Pike's Peak is to the south. On the southwest side of the summit is a steep gully, almost perpendicular in some places, which extends down to South Park. We amused ourselves for a short time by rolling rocks down the steepest part, to hear the reverberation. The momentum attained was so great that they went through a large snowdrift, which lay in their way, without the slightest apparent check to their speed, finally to be dashed to pieces against some invisible obstacle far below. The crash was distinctly audible, as well as the low rumbling which preceded it. A large rock which was sent down directly after one somewhat smaller, overtook the lesser one and sent it flying into fragments.

This amusement came near ending in a tragedy. The observer had stepped on a bowlder which overhung the precipice, in order to loosen a large, round stone, when I noticed a slight movement of the rocks and spoke to him just in time. He jumped upon the firm rocks, and the next minute down went the bowlder with a number of other stones, great and small, crushing, tearing, roaring, shivering to atoms, on their way; and finally came the thunder at the bottom of the gully. We remained for some minutes speechless, thinking of what might have happened.

On our way to the station another accident threatened, this time to me. Passing over a soft snowdrift, I suddenly sank to the waist, and, had I been alone, would in all probability have staid there, as one of my feet was caught between some rocks. My companion, who was on firmer footing, pulled me out by the shoulders. Hardly had we reached the building when there came up a blinding snow squall, which, however, did not last very long. It reduced the temperature from 35° to 29°, only six degrees, but it seemed a great change. The anemometer showed that the wind was blowing at the rate of twenty miles an hour, and the barometer marked 17.871 inches, which at the sea-level would be 30.081 inches, the difference being 12.210 inches at that height above the sea.

As the squall cleared off, the sun came out in a blaze of glory just before it set and gilded the tops of the mountains, which stood out in bold contrast to the sombre valleys. One has no true idea of the height of Pike's Peak until he stands on the

summit and looks down, and this sunset seemed to me the best time to realize it.

We spent the evening looking over the records, the observer very kindly explaining to me what I did not understand about them. The cold wind was howling outside, but it was warm and cheerful within, and the place did not seem so very lonely until we had retired and the light was out. Mr. Sweeney was soon asleep, but I, — unaccustomed to the light air, together with the excitement and fatigue of the day — was not able to sleep for some time, and fully realized the extreme desolation. The moaning sound of the anemometer, as it whirled outside on the roof, added greatly to the loneliness.

In the morning I bade adieu to my friend (as he had proved himself to be by many acts of kindness) and started down the mountain, — with the same guide as on the ascent, the telegraph wire, — soon reaching the “jack-straw region,” a most appropriate name for this confused mass of dead timber. The air was cold; the temperature had fallen in the night to 20°, and when I left the station it was at 26°, with the wind blowing at sixteen miles an hour, and the barometer standing at 17.871 inches. Soon, however, a warmer climate and heavier air was reached at the Lake House, where dinner and rest occupied four hours.

Setting out again much refreshed, I walked rapidly down the trail, not stopping until I reached the toll tent. Resting here about half an hour, I again started for Manitou, pausing only at the Iron Spring for a drink of its water, and reached the Manitou House where I received a cordial welcome.

The Winter Excursion to the White Mountains.

BY JOHN RITCHIE, JR.

ALL through the long day we watched and waited. The most violent snow-storm of the winter had filled the closing hours of January with fear lest our once deferred winter excursion

to the White Mountains should be again delayed. The driving snow fell fast, and when, on retiring, the order was given for an early call, the precaution seemed needless, so slight was the chance that we might be permitted to go. But on Wednesday morning the sky was clear. The city streets were piled high with snow-masses, through which the early milkmen were attempting to break out their paths. Plunging through the depth of snow that covered the yet untouched sidewalks, we picked our way to where the busy plough, in its ceaseless rounds through the night, had kept open the most important arteries of the city's life. A crowded car was an accommodation almost un hoped for, and an early hour found us at the station ready for an early conference and an early start. A climb to the dingy apartments which constitute the sanctums of the good-natured officers of the Eastern Railroad announced the fact that the road was not blockaded, and, as if to silence doubt in this regard, a ponderous locomotive puffed its way up to our very feet, with its express train from Portland, somewhat belated, it is true, but an evidence of the good condition of the road.

Without a word of discussion it was settled that we would go; and, as person after person came in sight, with wraps and comfortable looking lunch baskets which proclaimed that no preparation for the trip had been omitted, we filed away to our special car,—the care of the railroad for our comfort and convenience reaching even to this extent,—and felt that in point of numbers, even, the excursion would be a success.

Snugly ensconced in our car, we seemed as if bound for some Arctic climate; for the committee of arrangements, mindful of the proverbial carelessness of man, had inserted in its circular of notification and advice a word on the necessity of warm clothing and wraps, and our friends, fearing the shock of a departure from warm furnace-heated houses to huts and barns, as they were inclined to consider them, in a frigid zone, had zealously attended to the matter in every trifling detail. We were sorry, when the warnings of departure were given, to find absent from our number some whose interest and intentions had been clearly expressed by the purchase of a ticket;

but on the other hand, it was remarkable that so few had been hindered by the storm, which, as it proved, was sufficiently severe almost to paralyze for a time the industries of the city.

A welcome addition to our party was made at Salem, and the train moved northward. The storm had here been much less severe, and its effects were less and less visible until, within the limits of New Hampshire, the passing snow-plough had left scarcely perceptible traces of its work. Meanwhile the party within was enjoying to the utmost the unusual novelty of the trip, the whitened landscapes as we swept along, and, not least amusing, the remarks of those who, by accident, entered our car, only to be seized by the brakemen and escorted forward. The unbelief of the masses that there were any foolish enough to attempt a pleasure trip to the White Mountains in winter found expression in these individuals, and the opinions with which they favored us were at times not particularly complimentary.

Chocorua was the first of the line of snowy mountains, and for a long time we watched its bold and rugged form and discussed the feasibility of a winter ascent. Then came the grizzled form of Moat, and, as we halted at North Conway, the overhanging mountains Kearsarge and Bartlett, and, far away up the valley of the Saco, the guardians which raise their towering heads above the river which they protect and nourish. The monarch of the range, Mount Washington, was veiled in clouds, and hence there was accorded to the lower peaks that attention which they so well merit.

After a brief delay at the junction with the Portland & Ogdensburg Railroad, we were set down — bags, bundles, rugs, and wraps — at the quiet Glen Station, which woke to life at our approach. Outside was Mr. Wentworth, our host, his face beaming with good nature, and his form an evidence of the good cheer he is so fond of dispensing to others; and alongside of the platform was a capacious sleigh, which, for the most part, had been that morning only rough lumber, but which the news of our coming had transformed into a large and comfortable vehicle capable of affording room for twelve to fourteen, if peaceably inclined. A more favored individual

or two found room in Mr. Wentworth's private sleigh, and taking the road leading up to Jackson City, they sped away more rapidly, but not more merrily, than ourselves.

Arden Cottage deserves more than a passing word, and to its comfort and cosiness was due much of the pleasure of the trip. Built to serve as the winter residence of its proprietor, its construction ensured a comfort that might have been sought for with difficulty among mountain hotels. Two great wood fires crackled and sputtered in two huge open fire-places, and sent their glowing beams out through the windows and across the glistening snow to welcome us on our arrival. Two large stoves ensured the warmth of the upper hall and adjacent rooms, and little "air-tights" were to be found here and there in the chambers. The porter, with large armfuls of wood, came again and again to replenish the open fires, and we were at last obliged to beg him to desist, and avail ourselves of screens against the heat, or take refuge in the sheltered hall. When the tinkling of the bell announced that tea was ready, we were not unwilling to assist; and, passing into a cheerful dining-room, with another busy fire crackling in its corner, we partook of a meal which would have done credit to a more pretentious house.

On Thursday morning we prepared for a trip through the Notch. Every arrangement had been made, either to go or not to go, but the day being pleasant, the decision was quickly reached. The large sleigh and a supplementary conveyance carried us over the smooth snowy roads to the station, where we found our car nicely warmed for us. The train passed us, paused a moment, backed, and took us in tow, and we began a memorable ride up the valley of the Saco, into the very heart of the mountains. The weird winter mountains were very different from those of the summer, as they frowned darkly at us across the desolate valley. They were not pure white, as had been expected, for the bare forests which covered their slopes gave a dark gray tint to their sides, with here and there patches of pure snow. The clouds hung low and cut off the view of the higher summits. The ice effects were most seasonable and novel. Down the mountain sides, where in summer dashed the merry cascades, all was silent, with the white

masses of the frozen cataracts and their long pendent icicles relieving the dark wall of rock. Nearer the road, and stretching far up the sides of Willey and Frankenstein, were huge masses of sea-green translucent ice. In fantastic forms they made a novel decoration of the rocky steeps, and from the trestle eastward they formed an almost uninterrupted chain of varied beauties, which we viewed from the rear platform of the car. The cascades of the Notch, milk-white in summer, preserved a semblance of their former appearance; and the spectacle of The Elephant, whitened by the snows of winter, attracted for a moment the attention of the party.

Our return passage from Fabyan's was quickly made, and, finding ourselves at Glen Station with still two or three hours of daylight, it was unanimously decided that we return to Jackson by the Thorn Hill road, so familiar to summer residents. Merrily we sped along, giving to our topographer ample opportunity to display his knowledge, so filled was the field of view with prominent mountains. The skill of our driver was lauded as he picked his way down the steep hill-sides into the quiet town.

And the coasting! It was a suggestion made by our host, and he supplied the means, leaving to us only the matter of furnishing the cargo. It was not that dangerous sport which finds its victims with each recurring year on our Common, but one conducted on an entirely different plan. With a lowered centre of gravity, the risks of an overturn were extremely small, and the steering was effected by the application of a tangible friction. An ordinary pung was procured, and the sides removed. To the tongue of this was attached a small sled on which were two steersmen, who, seated astride, were able to guide us in our rapid course by the application of their feet to the snow on one side or the other. Far up the steep hill-side we climbed, and, loading to its fullest capacity the floor of the pung, we swiftly glided down over a succession of steep pitches at a rate which fairly took away our breath. From underneath the shadow of overhanging rocks we glided out into the clear moonlight, and with shouts of merry laughter and screams of delight we awakened the slumbering township to something approaching life. When fairly sated with this rare sport, we

coasted even up to the door of our cottage and retired to peaceful rest.

Friday morning was clear and fine, — not too cold, yet cold enough to give us life and spirits. It seemed provoking to have come far up into the region of cold and snow, and see the thermometer at its usual home figures, about 10° F. When it came to the discussion of the excursion for the day, the voices of nearly all were for a ride across the Intervales to Conway Corner, but two, with true Appalachian spirit, decided that the excursion could not be complete without the ascent of a mountain in winter, and accordingly attempted the ascent of Thorn. The rest of us, just comfortably filling the big sleigh, started on our long ride. Merrily we glided along over the smooth snowy track, — which here and there, by some slight detour, avoided the drifted centre of the road, — and enjoyed to the utmost the prospect on every side. The landlord at Conway Corner, speechless with surprise at the advent of so many guests in the dead of winter, awaited our arrival at his door, but we gave him not long to recover from his amazement, for during the last half hour the wind had risen, and we were very glad to be under cover. A fire was soon burning in a sitting-room, and made the cold hotel habitable. A lunch which we had brought with us was spread in a neat dining-room, and went far towards making our picnic a success. On our return, the cold wind swept down upon us from the snowy mountains across the frozen Intervales, and we gave our robes an extra tuck and rejoiced that they were so plentiful. It showed us what New Hampshire can do in the way of cold breezes, and we were very glad to gain the sheltered portions of the road above Conway. Anxiously we watched the filmy cloud-covering through which Mount Washington played with us at hide and seek, and ever and anon we caught brief glimpses of the highest point. Over across the valley, against Moat, we could see the cloud streamers form as the moist air struck against its chilly sides, and to the front rose that familiar view of the Presidential Range, blanched and whitened by the snows of winter.

After tea a walk was proposed ; and, without knowing what was in store for us, we turned our steps towards the summer-

house on Sunset Hill. Arriving at the base, we found that the spare time of the mountain climbers had not been wasted ; for through the deep drifts a path had been cut, rising by steps and making easy more than half the ascent. Arrived at the top, the view was grander than we could by any possibility have expected. Mount Washington had steadily kept its head wrapped in clouds, only to appear at last with greater magnificence than ever. Glistening in the clear moonlight, it rose far above the mountains that shut in the Pinkham Notch, and in vivid contrast to their dark masses. Majestic in form, clear in outline, pure and white in the moonlight, it was a view of surpassing beauty. For a long time we waited with our faces turned towards this rare sight, and then the word came that we must go. Slowly we returned to the cottage ; and some, not satisfied, climbed the road over which we had coasted the previous evening, and from another point of view secured another phase of the same picture. From this place, the more sharp-sighted could even discern the gleaming roof of the Tip Top House, while the two ravines cast deep shadows on the sides. At the cottage we found a lunch of pop-corn and apples, with delicious cider, set down by the fire for us, and we refreshed ourselves accordingly. The thermometer, which had marked zero during our walk to Sunset Hill, was steadily falling ; and, on our return from the second point of view, we were delighted to find it 6° below. Through the night it kept on its downward course, and at five in the morning, just before our early breakfast, it marked 12° below.

It was to catch an early train that we were awakened so early on Saturday morning, and shortly after six we were snugly packed in our sleigh and on our way to the station. The cold air did not seem so very cold, for it is different in quality from that of the seashore, and our ride was by no means a hardship.

A bend in the road, as we neared Sunset Hill, showed us Mount Washington clear and lovely as ever, its tip tinged with the faintest suspicion of the rose which announces the dawn. From the platform of the station we watched it as the rose crept down the whitened sides, and we were glad when we found our car-fires low, since we could sit and watch the sight

unannoyed by the frosting of the panes. Far down the road, past North Conway, we crowded the platform and the end of the car as the rising sun added splendor to the view. The experience of that morning alone was worth the journey.

One by one the mountains faded from our sight, and in amusements, reminiscences, and refreshments we passed away the return trip. As we neared the city the air thickened, and soon the falling snow-flakes told us that we had stayed away just long enough, for a second severe storm was beginning.

With the remembrance of our winter trip to the White Mountains will ever come an appreciation of the cosey little Arden Cottage, and the watchful care of our host; and we live in hopes that the experiment may be repeated which, at its first trial, proved so thoroughly successful.

The Slide on Tripyramid.

By CHARLES CUTTER.

Read August 20, 1879.

Early in the month of October, 1869, in the midst of a heavy rain and flood that caused much desolation in this mountain region, happening to turn my eyes in the direction of Waterville, I was struck with the novel appearance that presented itself on the side of one of the Tripyramid Mountains. It seemed as if Ossian's "Ghost of the Hills" had suddenly appeared in the shape of a lady with trailing dress upon the declivity of the mountain, bending forward a little as if in the act of rapid transit to some other region. It was evident that a slide of unusual extent had occurred, and my curiosity was awakened to visit the locality and take observations, which I was enabled to do, shortly after, in company with Professor Perkins of the University of Vermont, and the Rev. Mr. Runnels of Sanbornton. Starting from Campton, we found the banks of Mad River strewn with trees that, with their bent and twisted roots and broken branches, had been stranded by the torrent in its downward course, some of them having been

carried beyond Campton Village, and probably into the Pemigewasset River.

On reaching Becktown, a level clearing upon the stream that comes down from these mountains, we found a great quantity of boulders in the shape of gravel, stones, and trees massed upon the surface. Farther on and up, the bed of the stream, since called Norway Brook, was deeply channelled by the mass of material that had come rushing downward in a promiscuous flow, in some places to the depth of fifteen to twenty feet, and several rods in width. Ascending the slide proper, with some difficulty, we found it at its apex only a few feet in width, but gradually widening downward for, perhaps, two thirds its length, where it measured twenty-six to twenty-eight rods, then narrowing again to about three fourths of that distance at its base on Norway Brook. We found the sides of the mountain rounded to the bare rock only in one or two places, a considerable depth of drift remaining almost through its entire extent.

Without making any pretence to scientific knowledge in this direction, the following is my theory of the slide. The long-continued and various rains had saturated the deep bed of mosses upon the mountain side, and likewise the drift below, to some depth, bringing the latter to something like the consistency of mud, and adding the weight of their water to that of the various material. At this stage a strong wind from the northwest, rushing over the ridge and down the side of the mountain, sweeping the trees and making such trees to act as a lever in working up the rocks, gradually loosened the whole mass of the slide from its fastenings, and adding its own force to that of gravity, sent it down the steep declivity of the mountain with a rushing Norway Brook. Here its course was arrested by the low ridge that rises from the opposite side of the brook. At the same time the column of boulders entered a deep ravine below, where, when a considerable body of water was

The "after" theory of the slide is, however, a consequence of the slide is certainly? Involving a further question, whether a cause after-the-fact, and not a pre-existing one, independent of the cause, could not have been the cause of the slide, and, if so, whether it is not a more probable cause than the one suggested by the theory of the slide, which is, however, a more probable cause than the one suggested by the theory of the slide.

length was gathered till in time it acquired sufficient force to burst its barriers and send the whole mass in a raging torrent down the stream, cutting in its course the deep channel to which I have previously alluded.

I would further state that I have a vague impression that previous to the slide there was a narrow strip of denudation along the line of a water-course down the side of the mountain. If so, the descent of the mass was more easily effected from the causes I have suggested.

There is a popular belief that what are termed water-spouts sometimes occur among the mountains. The notion is that a cloud bursts, and its volume of water is poured down upon the earth as from a spout. That this notion has some foundation in fact I have no doubt. I have sometimes noticed two thunder storms, driven before winds from opposite quarters of the heavens, at length meet, when an equilibrium would be produced in the atmosphere, the two clouds unite and remain stationary for a considerable time over a given space, pouring down torrents of rain until their supply was exhausted. By atmospheric and electrical agencies like these a vast quantity of vapor might, under favorable circumstances, be gathered into a limited space, and by rapid condensation produce the phenomenon commonly ascribed to water-spouts. Something of this nature, occurred, I think, somewhat more than twenty years ago in the narrow space between Black Mountain and Weetamoo; when, by a tremendous downpouring of rain, deep gullies were cut in the well-sodded pastures, great quantities of sand, rock, and gravel washed down upon the intervale, the old road over the hill to Sandwich completely ruined, and the bridge on the stream that comes down from Weetamoo carried away by the flood. That anything of this kind took place at the time of the Tripyramid slide, I have my doubts. Electrical agencies are not usually especially active so late in the season; and the severe northeasterly storm during which it took place, sufficiently accounts for its occurrence.

Hypsometric Measurements of Some Points about Williamstown, Mass.

BY SILAS W. HOLMAN.

Read February 8, 1882.

THE measurements to determine the altitudes given in the following tables were made during the summer and fall of 1881, the thermometric observations at the upper stations being taken wholly by Mr. John Tatlock, Jr., a member of the senior class of Williams College, who has also made the computations of the results. The hypsometric method was used on account of the difficulty of obtaining at the time a suitable mercurial barometer for transportation to the different points. The thermometer used was one by Casella, of London, and numbered 2704. It is the property of the Physical Department of the Institute of Technology, and was made to replace one which had constituted a portion of a "hypsometer of Regnault," as described in most text-books on Physics. Instead of the wrongly designed brass heater usually described for this apparatus, a tin double-walled vessel was used, of the form generally adopted for the determination of the boiling-point of thermometers, the dimensions being modified to suit this special case. The whole arrangement was found to give very satisfactory results.

The method employed in the observations and their subsequent discussion may be briefly described as follows.

At the upper station a series of observations of the temperature of boiling water and of the air was made by Mr. Tatlock. At the lower station a simultaneous series of readings of the mercurial barometer, James Green, No. 400, situated in the east room of the old astronomical observatory of Williams College, and at the same time of the air temperature, was made by myself or some other observer. Before and after each excursion the indication of the hypsometric thermometer in the steam from boiling water was determined at the observatory, and simultaneous barometer readings taken. This ren-

dered it possible to eliminate almost wholly the relative instrumental errors of the barometer and hypsometer. In all hypsometric readings the thermometer was immersed in the steam, with the bulb out of the water, and with the stem for half an inch or more above the top of the mercury column, also in the steam. To read, the tube was drawn up through the stopper until the mercury thread was just visible, and after a reading it was again pushed back into the steam. The barometer readings were reduced to the freezing point by Guyot's tables, Smithsonian collection, and proper corrections to the readings of the thermometers in air were made from a comparison of the instruments. Thus all relative instrumental errors were so far eliminated as to become nearly, if not quite, as small as mere errors in reading the hypsometric thermometer; and an inspection of the nature of the work will show that the absolute value of the error of the mercurial barometer used, the only remaining instrumental error to affect the results, would be of almost no sensible effect,—certainly much less than the errors arising through the uncertainty of the air-temperature and humidity corrections in the computations involving these. It is thus apparent that the conditions under which the hypsometer, or thermo-barometer, was here used were more than usually favorable. The concordance in some of the measurements given below will show that this had its due influence upon the results. Owing also to the skill and care exercised by Mr. Tatlock, and the repetition of readings in all cases, there can be no reasonable doubt that the results obtained are quite as good as would be possible from the use of mercurial barometers, except when used with special precautions. It may be said that all the strictly meteorological conditions affecting the accuracy of barometric measurements have precisely the same effect in hypsometric work. The only gain in the use of the thermo-barometer is in convenience, and in the elimination of the error almost certain to arise from the inaccurate determination of the temperature of the mercurial column in the barometer at the upper station. The barometric pressures, corresponding to the temperatures of steam, were taken from the tables in the Smithsonian collection giving the results of Regnault as revised by Moritz.

The measurements are not sufficiently numerous to warrant an attempt at this time to discuss either the accuracy possible with the thermo-barometer or the nature of its errors. I will only allude to the possibility of considerably diminishing the gradual rise of the readings of the instrument by a long-continued heating in an oil bath at 250° to 300° centigrade, followed by a very slow cooling. The fluctuations due to sudden heating and cooling may be largely eliminated by avoiding unnecessarily rapid changes in the temperature of the bulb. This requires merely a little care on the part of the observer. With a thermometer graduated, as this was, to tenths of a degree Fahrenheit, so that the hundredths may be readily estimated by the eye, a much greater certainty in measurements may be attained than by the use of an aneroid barometer.

The height above the sea-level of the points given in the following table is calculated from that above the observatory by adding 708.4 ft., the height of the latter above the sea. This had been ascertained by students who had levelled up to the college from points fixed by railroad surveys.

Point.	Height above sea. Feet.
Greylock	3535
Prospect (Centre peak)	2591
Bald Mountain	2597
Bald Mountain (Camp Ground)	2389
The Vista (near Camp Ground)	2380
Sunset Rock	1992
Berlin Mountain	2790
Berlin Pass	2192
Walker's House on Berlin Road	1563
Petersburg Mountain	2534
Petersburg Pass	2075
East Mountain (Copper bolt)	2276
“ “ (South peak)	1917
Stone Hill, Williamstown	1086
Williams College, Old Observatory	708.4

The series of observations which gave the height of Bald Mountain Camp Ground affords a good test of the concordance

of results of independent observations. No opportunity occurred for the comparison of the thermometer and barometer during this series.

Time	Ht. above Observatory. Feet.	Diff. from Mean.
Aug. 4, 7 A. M. . . .	1679.	— 2.
" 5, 7 A. M. . . .	1663.	— 18.
" 6, 10 A. M. . . .	1689.	+ 8.
" 8, 2 P. M. . . .	1674.	— 7.
" 9, 7 A. M. . . .	1691.	+ 10.
" 9, 2 P. M. . . .	1691.	+ 10.
Mean	1681.	Average 9.

It will be seen that these determinations are, so far as instrumental errors are concerned, entirely independent of each other. The average deviation of the separate results from the mean is only nine feet, or about one half of one per cent, but it is of course possible that the result is vitiated by some constant error of greater magnitude than this. The height of Greylock is the mean of two series of observations made on successive days, the means of the two differing by about 25 ft., the average difference from mean being 12 ft., and the extreme difference between any two observations only 50 ft.

The heights of Prospect and Greylock had previously been determined by Mr. S. H. Scudder; that of Greylock with a mercurial barometer; that of Prospect by levelling from a point near the foot of Stone Hill. A single barometric determination of Greylock was made by Professor A. Guyot some years since. The results of the three determinations are as follows:—

	A. Guyot. Feet.	S. H. Scudder. Feet.	J. Tatlock, Jr. Feet.
Greylock	3505.	3543.	3535.
Prospect		2572.	2591.

A Contour Map of the Mount Washington Range.

By W. H. PICKERING.

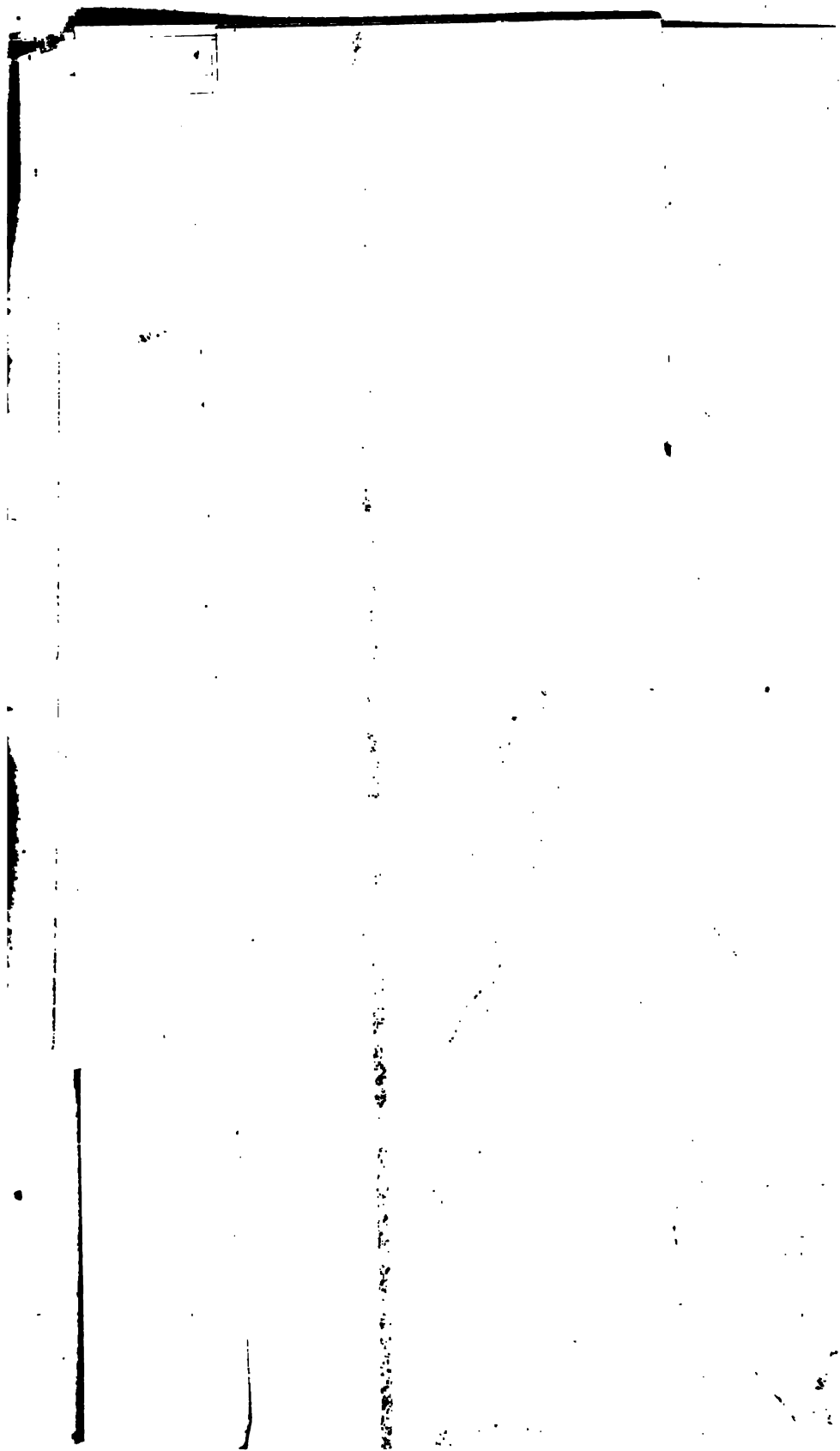
THE observations on which this map is founded have been gradually accumulating since the summer of 1876, and are of four kinds: those made with the telescope, barometer, camera, and eye. Those with the telescope were made chiefly by the United States Coast and Geodetic Survey, Professor E. C. Pickering, and Mr. J. R. Edmands. From them the positions of the more important summits were determined, and also the elevation of some points in the lower regions of the map whose height otherwise would have been unknown. In this class may also be included some observations made by myself with a pocket sextant. The barometric elevations of most of the higher summits were taken from the list in APPALACHIA, Vol. II, p. 131. Several were taken from Osgood's White Mountains, and a number were computed by myself from observations taken in the ravines and elsewhere with an aneroid. The camera profiles were drawn exclusively by Mr. Edmands, and furnished valuable data for both horizontal and vertical positions. A large number of photographs were also consulted. By means of eye observations the earlier maps on which this one was founded were constructed, and later on the smaller details of the present map were filled in as related below.

In the construction of future contour maps the following hints may be found useful.

The horizontal positions of all the summits included must be determined with some accuracy before anything else can be done.

The summits should be visited in order, and the positions of the intermediate ravines and ridges marked by the eye. This should be done with two curved lines, one representing the edge of the ravine and the other its bottom. These lines will not coincide with contours. The ridges generally run towards the summits, so that their direction can be obtained with some accuracy by sighting from these points.

The positions of prominent objects, such as lakelets, bowl-





ders, the tree-line, and changes of slope may now readily be obtained by hand profiles and photographs. By this means also the position of portions of the upper ravine-line may be corrected, by drawing tangents to it from stations whose positions are known. The hand profile should always contain at least two known points, as it can only be used for interpolation, and three points would be still better. When there is not sufficient time for a sketch, the position of near points with regard to other points accurately located upon the map may be stated in the note book. Thus, "Boulder. Kearsarge .3 N. Moat," would mean that, as seen from the station occupied, the boulder lies apparently three-tenths of the distance from Kearsarge to North Moat. For these purposes the construction sheet must be large enough to include all the prominent adjacent mountains. Where there are no mountains conveniently situated, the pocket sextant forms a very accurate means of obtaining the angles.

The locations of the carriage roads and railways, if there are any, may be represented on the map.

Having all the horizontal positions definitely settled, the elevations will now require our attention. The height of every point that is known should be set down against it. In general the unit figure may be omitted. The angle at which a slope lies may be determined either from above by an inclinometer, or pocket sextant, or from one side by a profile. In the latter case, care must be taken to guard against foreshortening. Given the slope, the horizontal distance between the contours may be calculated, and this, together with the known elevations, will enable one to fill out the whole system of contour lines. Profiles from surrounding mountains are often of great use; and the tree-line and position of prominent points should always be indicated on them, even when not sufficiently prominent to show in the sketch.

The stream-lines should next be inserted, as these may slightly modify the contours.

Finally, put in the tree-line, paths, and names.

The present map (Plate II) is constructed on a scale of $\frac{1}{50000}$, or very nearly $1\frac{1}{4}$ inch to a mile. The positions of the more important summits were taken directly from Mr. Edmands's man-

uscript map, and may be considered accurate within one twenty-fifth of an inch. The others were obtained as above described. The contours are drawn every 500 feet, and probably there are very few places on the map where the error of altitude is equal to this amount. For the benefit of topographers the Appalachian nomenclature has been adopted, and all the more important points on the map are designated by it.

According to this system the State of New Hampshire is divided into twenty-six sections, named after the letters of the alphabet. Only portions of sections D, F, K, L, and M, occur on this map. Each section is divided into a number of areas, each of which culminates in a mountain-peak, and each area is designated by a numeral. Thus, F 6 refers to that area which culminates in Mount Washington. To each of the great ridges of the mountain a second numeral is applied, separated from the first by a dot. Thus, F 6 . 2 means Boott's Spur on Mount Washington. But for maps on a large scale, like the present one, it is necessary to carry the system a step farther. Therefore any important crags or isolated boulders upon these ridges are named by means of the small letters of the alphabet. Thus, F 6 . 2 d, means a conspicuous rock on Boott's Spur, on Mount Washington. To avoid repetition, when it is well understood what region we are describing, we may leave off the first letter, and speak of the rock, for instance, as 6 . 2 d. Or, if it is known that we are referring to Mount Washington, we may even speak of 2d.

As regards the naming of localities, in the large majority of cases the point whose position was determined was merely designated by the Appalachian nomenclature, and no proper name was applied. A few exceptions were made to this rule where, on account of its prominence or the frequency with which it is necessary to refer to it, a name seemed desirable. The following names are, we believe, the only new ones applied. Among mountains, "Mount Isolation," which explains itself, and "Mount Davis," named after the guide who constructed the path over its summit in 1845. It seemed to us also that the rock which we have called the "Hanging Cliff," deserved a name on account of the glorious view to be obtained from it, and also because of its prominence upon the crest-line of Tuckerman's

Ravine. "Jefferson Ravine" was previously nameless. "Appalachian Cascades" and "Rocky Branch Range" were names we had applied in print the year before. "The Shoulder" is the prominent crag on Mount Washington, which, as seen from the Glen, appears more conspicuous and important than the summit itself. The term "Great Range," has been given a definite meaning, instead of the very vague one it had before. The original name has been given to "Ball Mountain," which through a misunderstanding has appeared on several of the recent maps as "Boy." Though the number of ravines indicated by the contour lines may strike one as large, none are represented which are not really there, and we think there is not a ravine or ridge upon the map which has not been carefully observed from one or more points.

The Mountains between Saco and Swift Rivers.

By J. RAYNER EDMANDS.

Read July 19, 1881.

THROUGH Section O runs an elevated water-shed separating the waters of the Saco on the north from those of its tributary, the Swift, on the south. Beginning, let us say, at the highest summit (6.1) of Mt. Tremont, the divide runs eastward to Mt. Silver Spring (5.1), thence southeastward across Swift River Notch, next passes southward over Bear Mt. (4.), then curves to the east and northeast, passing over Table Mt. (3.2), and continues the curve till it reaches the summit numbered 3.4 with a north-northeasterly direction. It now turns abruptly, runs east-southeast to North Moat Mt. (1.1), and thence south-southeast to South Moat Mt. (1.4). All these summits are mapped on Plate III.

The name "The Moats" is ordinarily given to the line of bare crests and summits which, seen from North Conway, appear as a continuous ridge nearly parallel to the direction of the Saco as it flows through the Conway Intervales. Indeed the continuity is sufficient to offer an easy route between the

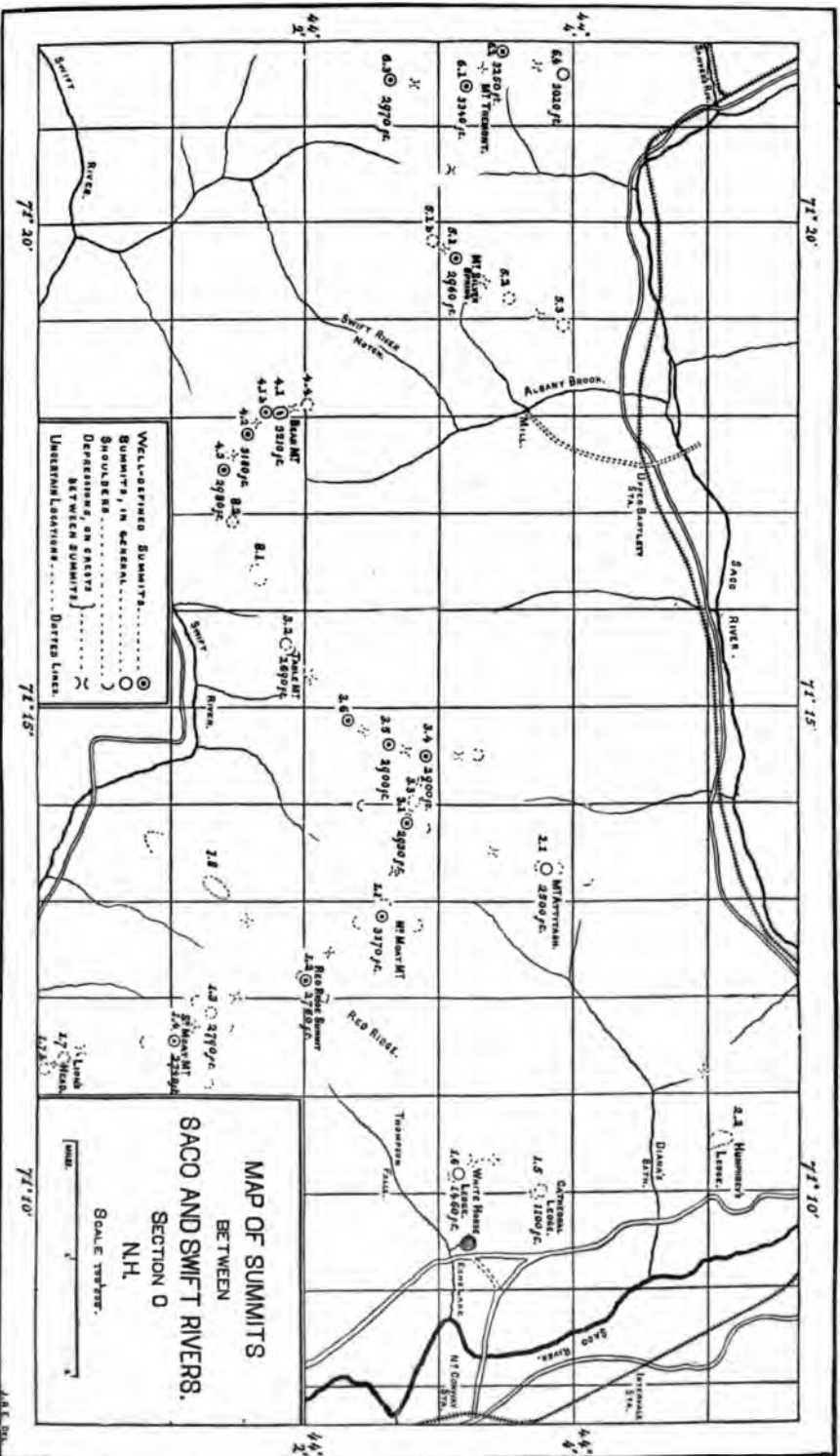
North and South Moats — using the Appalachian cuttings through scrub and jack-straws — although it may be doubted whether the general direction is that of any single axis of upheaval.

The mountain mass numbered 3., lying between North Moat and Table Mts., is well worthy a name, but as it is not our purpose to suggest one we refer to it as the “western spur of Moat.” The appropriateness of such a designation is well seen upon the Dundee road north of the town of Jackson, where the North Moat appears as the central summit of a beautifully symmetrical group, the Red Ridge Summit (1.2) and the South Moat showing on the left, while this western spur rises to equal prominence on the right. The connection of the western spur with the North Moat is also quite as intimate as is that of the southern spur, the deepest depression being on the latter, south of Red Ridge Summit; and the distinction caused by the barrenness of the southern spur is accidental, being due to a large fire.

The western spur of Moat is made up of two ridges running not far from north and south, connected by a high intermediate ridge, the whole imitating on the map a letter H with the upper left hand and lower right-hand arms shortened and the opposite extremities extended. The ravine on the north side between the ridges is well seen from the town of Jackson. In the vicinity of Intervale Station, near North Conway, the summit (3.1) of the eastern ridge shows to the right of, and behind, the North Moat, and upon the right-hand arm of the ridge, as we thus face it, rises Mt. Attitash (2.1) whose name we owe to the editor of Osgood’s Guide Book.

The summit 3.1 is correctly shown upon Mr. Henck’s map,¹ but the western ridge, bearing the high summits (3.4 and 3.5), is not hinted at upon any of the maps with which the writer is familiar. Near Upper Bartlett Station this ridge is conspicuous, while Mt. Attitash is a ledgy summit showing behind it on the left of the high summits. Whether this anonymous mountain-mass be viewed from east or west, therefore, the nearer of the two ridges dwarfs or hides the other; and this fact has caused the omission on the maps. From elevated

¹ Appalachia Vol. I., No. 1.



points all parts of the mountain are visible, but so clustered that unusual care has been necessary to distinguish them.

Table Mt. (3.2) is not conspicuous at a distance, but it is well seen from near points north or south, such as Upper Bartlett or Mt. Chocorua. The name was applied by Mr. Henck on his map to Bear Mt. (4.), but he early mentioned that it was an error, and the writer's inquiries have confirmed the correction. The error, however, was copied upon the State map and consequently upon that of the Eastern Railroad. We have also heard the name Table Mt. applied to one of the hills numbered 8. on our map. Bear Mt.¹ and Mts. Silver Spring² and Tremont³ are elsewhere referred to.

The first deep depression west of North Moat Mt. is the one east of Bear Mt. We are therefore warranted in applying to the whole region east of this depression, as far as the Saco, the general term of "The Moat Mountains," of which Table Mt., together with Humphrey's, Cathedral, and White Horse Ledges would be recognized as foot-hills.

The positions of the summits as mapped on Plate III. are from surveys by the writer. The streams and roads are taken from the State map, with such modifications and omissions as proved necessary to confine the streams to the valleys. The dotted lines, intended to give a better idea of the topography, do not rest upon so good a basis as could be wished. The approximate heights were calculated by Professor Pickering and the writer, from a partial discussion of micrometer-level observations made by the former in 1876. They rest upon the primary figure 3,251 feet for the elevation of the northern Kearsarge (Pe-quawket), the value given provisionally by the U. S. Coast and Geodetic Survey. The numbers by which the summits are designated are those used respectively for summits in the *same positions* (as nearly as may be) on Mr. Henck's map, wherever such were there given. Summits not given on that map have always received designations not used upon that map. A suggestion in regard to the summits of Mt. Tremont⁴ has not been adopted, since it would be a departure from the practice just mentioned.

¹ See page 69.

² Appalachia Vol. II., p. 282.

³ Ibid. Also Vol. I., p. 124.

⁴ Appalachia Vol. I., p. 125.

Report of the Recording Secretary for 1881.

The resignation of my honored predecessor, closing his fifth consecutive year of active service, occasioned a loss to the Club which was proportioned to his strong interest and efficient aid in more than one department of its work. In his last annual report he referred to the condition of the Club as one of general prosperity. It is my pleasure to record a continuance of this in full measure for the past year. The membership of the corporation has increased from 320 to 421, a greater gain than in any previous year. A specially gratifying increase is that in the life membership, which has risen from 5 to 10. The honorary and corresponding members now number respectively 9 and 33.

Nine regular meetings have been held during the year in Boston, and two field meetings, one at Jackson, and the other at Bethlehem, N. H. In connection with excursions informal meetings have also been held at Williamstown, Mass., and at the Glen House, N. H.

Excursions have been made to Doublet Hill, in Weston; to Williamstown; and to the Uncanoonucs, near Manchester, N. H.: also, in connection with the field meetings, to Thorn Mountain; through Carter Notch,—including an ascent of Carter Dome; through the Great Gulf on Mount Washington; to the Franconia Notch; to Lancaster; and to the Percy Peaks in Stratford, N. H. The trip to the Uncanoonucs was made in October, and as the experiment of an autumn excursion was quite successful, it is to be hoped that it may be repeated. The custom of holding an annual Reception seems to be now well established, the one in January last having been equally enjoyable with its predecessors.

Through the active exertions of the Printing Committee, two numbers of APPALACHIA have been issued during the past year, thus completing Vol. II. The treasury has fortunately been able to meet all demands upon it from this source without outside aid.

The library has received considerable additions during the year, consisting largely of magazines and publications of

foreign Alpine Clubs and Geographical Societies received in reply to a circular sent out about a year ago. The offer by the Natural History Society of an alcove in its library has been accepted, and our library has been transferred to that building. It is now being catalogued in connection with that of the Natural History Society, and when this is completed and the books and magazines conveniently arranged, it is earnestly hoped that our members will avail themselves of their use much more extensively than has hitherto been possible.

The plan proposed by Mr. Edmands at the beginning of the year for a series of section maps on permanently mounted sheets, in a suitable cabinet, has been adopted, and by the aid of a special subscription the work is satisfactorily progressing.

The long-felt want of a Club seal has been supplied, and it is hoped that the device which appears on the title page of APPALACHIA, Vol. II., will meet the approval of the members.

The Club was fortunate in being represented at the Alpine Congress held in Milan in August last, by Mr. J. B. Henck, Jr., the former Recording Secretary. Great courtesy and consideration were shown the Club through him.

The Club is still indebted to the Massachusetts Institute of Technology for its continued kindness in granting us free use of its rooms for our meetings. While we still look forward to the time when our Club shall have rooms of its own, we can but congratulate ourselves that we are so comfortably provided for at present.

In conclusion it is pleasing to note an increased interest in our own city in the workings of the Club,—as shown by a larger attendance on the meetings of late,—and a readiness among the people in the mountain region to recognize and further its activities. Considerable favors have been shown us during the past year by railroads and hotels, and the practical benefit of the Club to the community is becoming more generally acknowledged. We may well be led by its present prosperous condition to renewed activity for its greater prosperity in the future.

Respectfully submitted.

R. F. CURTIS, *Recording Secretary.*

Treasurer's Report for 1881.

The receipts for the year ending Dec. 31, 1881, were as follows:—

From balance on hand Dec. 31, 1880 . . .		\$ 261.50
“ admission fees, 111 new members . .	\$ 222.00	
“ assessments for 1881 from 192 members	384.00	
“ assessments for previous years 9 members	18.00	
“ assessments for 1882 in advance . . .	12.00	\$ 636.00
“ four payments for Life Memberships, from Mrs. M. C. Sparks, Messrs. Samuel H. Scudder, Benj. F. Shaw, and Francis Blake		120.00
“ sales of Appalachia:—		
bound copies	27.00	
separate numbers	114.40	141.40
“ donations:—		
From Miss E. J. Baker (for library)	5.55	
Balance of Campton subscription on account of Thornton-Warren Path .	9.00	
Through Mr. C. E. Lowe, on account of Mt. Adams Path	3.00	
From Prof. E. C. Pickering and Dr. J. H. Dix, on account of Twin Mountain Path	10.00	
From visitors and residents of Fran- conia, through Miss M. J. Stone, on account of Bridal Veil Falls Path	35.00	62.55
“ interest on investments	17.59	17.59
Total net receipts for the year	\$ 977.54	977.54
Total		<u>\$ 1239.04</u>

The expenses were as follows:—

Paid for postage, stationery, &c.	\$ 199.22
“ for binding copies of Appalachia as gifts to hotels	10.00
“ for clerical services employed for Secretary and former Treasurer	19.75
“ for printing and advertising	194.87
“ for printing Appalachia, &c.	236.23
“ for Department of Improvements	66.00
“ for Department of Topography	37.95
“ for Department of Exploration	2.00
“ for Field Meeting Expenses	22.70
“ for deposit in Suffolk Savings Bank of cash re- ceived from four life members	120.00
Total payments	<u>\$ 908.72</u>

TREASURER'S REPORT.

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Total payments carried forward \$ 908.72

Balance on hand Dec. 31, 1881:—

Cash in Cambridge Savings Bank	\$ 292.87		
“ “ Suffolk Savings Bank	9.85		
“ “ hands of Treasurer	27.60	330.32	330.32
			<u>\$ 1239.04</u>

I received on November 21 the books of the former Treasurer. Six weeks experience has shown me how much the Club is indebted to Colonel Folsom for his thorough and faithful performance of the duties of the office. In accordance with his plan, I append a classified statement of receipts and expenses since the Club was established.

STATEMENT OF RECEIPTS FOR FIRST SIX YEARS.

YEAR.	FROM MEMBERSHIPS.					FROM SALES OF APPALACHIA.			From Interest.	From Donations.	From Life Memberships.	Total.
	Admission Fees.	Yearly Assessments.	Back Assessments.	Assessments in Advance.	Total.	By Sec'y and Treas.	By Publishers.	Total.				
1876	252.00	....	....	....	252.00	24.00	19.00	43.00	....	....	....	295.00
1877	52.00	248.00	12.00	....	312.00	74.00	24.00	98.00	....	....	....	410.00
1878	76.00	226.00	16.00	....	318.00	48.00	23.00	76.00	....	43.00	60.00	497.00
1879	148.00	290.00	40.00	....	448.00	119.00	11.00	130.00	2.00	222.00	....	802.00
1880	178.00	336.00	24.00	....	538.00	106.00	11.00	117.00	11.00	86.00	90.00	842.00
1881	222.00	384.00	18.00	12.00	636.00	....	....	141.00	17.59	62.55	120.00	977.04
Total	928.00	1454.00	110.00	12.00	1868.00	....	....	605.00	30.59	413.35	270.00	3823.04

STATEMENT OF EXPENDITURES FOR FIRST SIX YEARS.

YEAR.	Permanent Fund.	Postage, Stationery, &c.	Miscellaneous Printing.	APPALACHIA.			Topographical Department.	Art Department.	Improvements & Exploration.	Clerical Expenses.	Field Meeting Expenses.	Total.
				Printing.	Maps.	Total.						
1876	....	36.00	74.00	106.00	35.00	141.00	....	....	15.00	....	....	266.00
1877	....	39.00	84.00	115.00	40.00	155.00	....	13.00	....	....	....	500.00
1878	....	84.00	161.00	157.00	52.00	209.00	....	....	....	....	....	....
1879	60.00	66.00	96.00	165.00	35.00	200.00	2.00	53.00	20.00	....	....	520.00
				18.00	15.00	240.00	19.00	....	159.00	....	....	612.00
				171.00	8.00	....	....	....	....	....	....	....
				28.00	....	....	....	....	....	....	....	....
1880	90.00	77.00	109.00	241.00	49.00	290.00	19.00	....	73.00	....	....	686.00
1881	120.00	199.22	194.87	236.23	10.00 ¹	246.23	37.95	....	2.00 ²	19.75	22.70	908.72
				....	....	....	....	....	66.00	....	....	....
Total	270.00	501.22	718.87	1237.23	244.00	1481.23	77.95	66.00	335.00	19.75	22.70	3492.72

¹ Binding.

² Exploration.

It will be noticed that about \$400 was paid during the year for postage, stationery, and printing. This is over forty per cent (40%) of our receipts, and I know of no way to diminish this expenditure, except by curtailing the thorough manner in which the Recording Secretary's work is performed. The work of notification is very complete, informing each member in advance of the intentions and purposes of the Council. The net receipts for APPALACHIA have increased since last year, and a well-directed effort of a special commission to manage the magazine can make it a source of revenue instead of expenditure, as it has been in the past. There is now due from subscribers who have received copies of former numbers, according to the list, \$40.70. This, I hope, will be paid at an early day. The cost of APPALACHIA, Vol. II. No. 4, must be paid from balance now in the Treasurer's hands.

During the year, subscriptions have been collected for a cabinet to contain permanently mounted sheets to serve as a basis for future Appalachian maps; but, as the committee charged with the matter has not completed its labors, the amounts received or spent for this purpose do not enter the accounts for the year.

The principal of the permanent fund has increased during the year by \$120, making a total of \$270, for nine members, to the credit of that account. The time, I trust, is not far distant when we shall have a list of one hundred life-members and one thousand annual members, all interested in the various departments of the Club. Every bill against the Club that has been passed by the Council has been paid, and is included in this report.

Respectfully submitted,

CHAS. W. KENNARD, *Treasurer.*

Reports of the Councillors for the Autumn of 1881.

Natural History.

By J. H. HUNTINGTON.

Although the amount of work done in this department by members of the Club has been quite limited, it is an encouraging feature that it is a continuation of the work of previous years.

Mrs. L. D. Pychowska has continued the study of ferns in the vicinity of Campton, N. H., and has had marked success, not only in finding new species but also in finding characteristic specimens of some species, about which there has been doubt as to where they really belong. She gives the following list of ferns in addition to those already published :

<i>Asplenium ebeneum.</i>	<i>Onoclea sensibilis. Var. obtusilobata.</i>
<i>Aspidium cristatum. Var. Clintonianum.</i>	<i>Botrychium simplex.</i>
	<i>Botrichium ternatum.</i>
<i>Aspidium spinulosum. Var. vulgare.</i>	<i>Ophioglossum vulgatum.</i>

In all, there have been found thirty-six different kinds, including species and varieties. Researches this year have established the fact that the *Botrychium simplex* is found in Campton as well as the *B. matricaræfolium*. In regard to the latter, Mrs. Pychowska says: "One specimen we obtained was twelve inches high, while others exhibited various freaks of growth."

There was also found on Welch Mountain the gray scrub-pine, *Pinus Banksiana*. This is thought to be farther south than any point where it has been previously seen.

Mr. C. E. Ridler, of Kingston, Mass., read a paper, before the American Association at Cincinnati, on "Some New Reforms in the Use of Botanical Terms," setting forth the advantage, especially for use in the schoolroom, of having in the study of botany nothing but English words for the English-speaking race. Mr. Ridler is a student in microscopic botany, and has an extensive herbarium, as probably some members of the Club have learned by their exchanges with him.

For the sake of comparison, I will mention a few things that have come under my own observation. On the west side of the Sierra Madre Mountains, in the vicinity of Oposura, which is not far from latitude 30° , and where the country has an altitude of from twenty-three to twenty-five hundred feet, most of the trees and shrubs were in flower by the middle of February. Very few genera, however, of all that grow there can be found east of the Mississippi River. In fact, there were only two I was sure of having seen, the *populus* and *plantanus*; the former is our cottonwood, and from this the catkins had already fallen. A large proportion of the trees, shrubs, and plants that grow here belong to the pulse family, of which the mesquite tree is a representative almost everywhere in the southwest, while there were many that are unknown away from this high and dry region. One tree in particular was very noticeable. It was from fifteen to twenty feet in height and had a smooth bark, almost white. The flowers were monopetalous, very nearly the shape and size of those of our morning-glory. The palm trees that grow in many places along the arroyos were a striking feature of the scenery. Two weeks later the yucca, which here sometimes attains the height of twenty-five feet, had put forth its immense panicle of flowers. They were often three or four feet in length. Of cultivated trees, the orange grows to a great size. One tree was thirty-five feet in height, and the trunk nearly two feet in diameter at its base. The date tree is the most striking of all the vegetation of this country. It rises to the height of fifty feet or more, having only a tuft of leaves at the top of the tall, straight, branchless shaft. But cultivated trees flourish here only where irrigation is possible.

Later in the season, on the first day of May, a search for flowers on High Island, about nine miles above Washington, D. C., was rewarded by finding thirty-one different kinds, and two plants only were found out of flower; these were the *Sanguinaria Canadensis* and *Jeffersonia diphylla*.

On May 24 blackberries, *Rubus villosus*, was in full flower on the Susquehanna River, near the boundary of Pennsylvania and Maryland. July 6 they were a little past full flower near Fredrickton, N. B.

To those who have studied the flora of the White Mountains the following list may be of interest; the plants were found in Pembroke Parish, New Brunswick, and most of them were in flower June 25.

<i>Cornus Canadensis</i> , (<i>Bunchberry</i>).	³ <i>Empetrum nigrum</i> , (<i>Empetrum</i>).
<i>Vaccinium corymbosum</i> , (<i>Blueberry</i>).	<i>Listera cordata</i> , (<i>Twayblade</i>).
<i>Vaccinium Vitis Idea</i> , (<i>Mountain Cranberry</i>).	<i>Iris Virginica</i> , (<i>Iris</i>).
¹ <i>Rhodora Canadensis</i> , (<i>Rhodora</i>).	<i>Ornithogalum umbelatum</i> , (<i>Star of Bethlehem</i>).
² <i>Ledum Catifolium</i> , (<i>Labrador Tea</i>).	

In geology, Prof. C. E. Hamlin has continued his study of the country about Mt. Katahdin, and we shall no doubt hear from him again in regard to that interesting region.

The Rev. G. F. Wright, well known from his studies in surface geology, has traced accurately the southern limit of the ice sheet in Pennsylvania. Entering the state at Belvidere, the terminal moraine was followed through the counties of Northampton, Monroe, Lucerne, Columbia, Lycoming, Tioga, Potter, Cattaraugus (N. Y.), Warren, Penn, Venango, northern Butler, southern Lawrence, northern Brown, into Columbiana County, Ohio, making, as Mr. Wright remarks, "a most surprising curve."

I shall mention only one point in my own observations. The succession of volcanic rocks is a question that has been supposed to be practically settled by the studies of F. Baron Richthofen, Clarence King, and Capt. E. C. Dutton. By none of these eminent men has basalt been regarded as other than the youngest of the volcanic rocks. Captain Dutton says that "the basalts are clearly the youngest of all eruptions," and again, "the true basalts everywhere reveal their greater recency than all other rocks." That there are marked exceptions to the order in which the volcanic rocks have been supposed to be erupted, is becoming evident to those who study them. One of these exceptions is so near the southern route of travel across the continent, that it is easily accessible to those who travel in that direction. About two miles directly west of Tucson, Ariz., there rises from the valley of the Santa Cruz a range of vol-

¹ Mostly in flower.

³ No flower to be seen.

² Hardly in flower.

canic hills. The rock at the base of these hills is chiefly a fine-grained basalt, but still there are some coarsely crystalline varieties with some volcanic ash. The second peak from Tucson is crowned by a light gray trachyte, and it is clearly the younger rock of the two, as the basalt is found on every side of it and immediately underlies it. Thus we have a rock which has been regarded as older than the rhyolites, crowning a hill of basalt, the supposed youngest of all the volcanic rocks.

Reports of Councillors for the Autumn of 1881.

Exploration.

BY W. H. PICKERING.

During the past summer some very interesting explorations have been made by different members of the Club. Several have been in the wilder parts of Maine, about Moosehead and the Rangeley Lakes. Others, in the White Mountains proper, have traversed the valley of the East Branch, and the New Zealand Notch. Two comparatively unknown summits, in regard to which information was desired, Bear Mountain and Passaconaway, have been explored. Another of the large ravines, the Great Gulf, has been traversed, and a path has since been completed through it.

Since this report was read, the Maine region has been represented by an article on Katahdin, APPALACHIA, Vol. II. p. 306. Bear Mountain, Passaconaway, the Great Gulf, and an interesting discovery in King's Ravine are described in appendixes to this report. Below is continued the list of prominent, but comparatively unknown, White Mountain summits, in regard to which information is still desired, or of which accounts have appeared in APPALACHIA since the last report of this department.

TABLE OF THE LESS-VISITED PEAKS OF THE WHITE MOUNTAINS (*Continued.*)

No.	Name.	Elevation in feet.	Reference.
1.	Shelburne Moriah (Bald)	4,400	
2.	Imp	4,000	
3.	Carter	4,700	
4.	Carter Dome	4,830	Appalachia, I. p. 76; II. p. 345.
5.	Wildcat	4,350	
6.	Royce	2,600	
7.	Montalban Range	3,000-5,000	Appalachia, II. p. 345.
8.	Parker	3,300	
9.	Field	4,400	
10.	Nancy	3,800	
11.	Bear	3,000	Appalachia, III. p. 69.
12.	Passaconaway	4,200	Osgood's Guide, p. 337. Appalachia, III. p. 72.
13.	Twin, North	5,000	
14.	Twin, South	5,000	
15.	Hale	3,400	
16.	Huntington	3,800	
17.	Garfield (formerly Haystack)	4,500	
18.	Blue Ridge	3,300	
19.	Waternomee	3,000	
20.	Cushman	3,300	

Of the fifteen summits still left undescribed, perhaps numbers 5, 8 and 9 are most accessible from the east, and numbers 18, 19 and 20 from the west side of the Mountains. As it is intended to construct a path over both the Twins next summer, we may expect ere long to hear from what are at present two of the most difficult and least known mountains on the list. Should there be sufficient enthusiasm displayed in the Club to carry out all the above projects, the list of unknown summits would be materially reduced in length before the next issue of APPALACHIA.

BEAR MOUNTAIN. (JULY 16, 1881.) BY J. RAYNER EDMANDS.

This mountain is situated in the region described on page 57-9, and represented on Plate III. It is conspicuous not only on account of its height, but because of the depth of the depression east and west of it. Its top consists of two summits of nearly the same height, somewhat less

than 230 metres (750 feet) apart, in a north and south line, with but a slight sag between them. The principal ridges descend north-northwest from the northern, and southeast from the southern of the two summits. The top assumes the appearance sometimes of a sharp, and sometimes of a truncated cone, but the idea of a *table*¹ would only suggest itself to one expecting to find a mountain warranting that name. It is covered by trees, partly evergreen and partly deciduous. Mount Washington is said to be visible from the northern summit (and doubtless is so in winter), and the peak of Chocorua is easily recognized from the southern summit. The view, if unobstructed, would be especially interesting, commanding at short range a region of whose details our knowledge is deficient; but it would take extensive clearing to secure this. The trees are rather large for climbing.

The depression west of Bear Mt. is known in Bartlett as the Swift River Notch. Through this runs an old logging road, and leading from it there has been cut within a year, a good logging road to a point high up on the western slope of Bear Mt. This furnishes a ready means of attacking the summit. In the following description of the route, the actual times made by the writer are ignored, but his estimates are given for the time reasonably to be allowed to the several portions of the route, over and above a proper amount of rest.²

Take carriage-road S. W. from Upper Bartlett, 2 kilometers (1½ mile) to Hard Wood Mill or Lewisville,—Bear Mt. lying at first directly ahead and afterward a little to L. Cross stream on R. of two bridges, and go W. on logging road. In 5 min. take L. ("France Camp" in the fork); in 5 min. more take R.; in 10 min. more pass log hut on R. and another on L. (a small brook of good water near latter), and keep evident road. In 8 min. more cross corduroy bridge. The brook thus repeatedly crossed rises in Swift River Notch and empties into Albany brook above Lewisville. Here we should turn off to R. if bound for Mt. Silver Spring.² Do not take L. near this. In 15 min. more pass through the Notch, crossing several corduroy bridges. Space cleared on each side of road in the Notch.

The road continues, slightly descending, but we take a newer road to L., gently ascending. After passing some underbrush it becomes very good. In 5 min. cross bridge. Small amount of water flowing W. Drink here. Road continually curves to L. ascending diagonally on western ridge of Bear Mt. Soon get glimpses of southern face of 6.1 (Tremont) between 6.3 and 5.1 (Silver Spring), but the view shifts westward and then southward. In 30 min. pass an apology for a camp, and beyond refuse successively two forks to L. Main road the lower of all. It then bends to R. crossing corduroy with steep ravine on R. After this (about 15 min. from "apology for camp") take L., ascending with Tripyramid well in the rear. In 5 min. more take L. We, however, took R., soon came to end of that road, struck E. through woods, and in

¹ See page 58.

² See Appalachia, Vol. II. p. 283.

30 min. (including 10 min. rest after a steep place) met the other road. We crossed this, and gained the northern summit of Bear Mt. in 15 min. more. This is of "whale-back" form, and from its southern end the other or southern summit appeared somewhat higher, but such appearances are not to be depended upon. To reach it descend S. 10 min. through thicket, and ascend 5 min. through clear woods. We left here a record on a tree-trunk. Clouds cut off distant high summits, and the growth rendered our view of the nearer mountains unsatisfactory.

Sufficient time was spent upon the summit to lose all idea of the direction from which we had approached it, and at this juncture nothing within the writer's means would induce his compass to point out the north. His guide (?), however, had caught a glimpse of a sharp summit which he asserted to be "Bartlett Haystack" (known to us as Silver Spring) and accordingly our descent was begun. It is fortunate that the summit of Chocorua (!) as seen from the north is so characteristic — otherwise we should have gone down to the head of the Swift River valley.

To descend from the southern summit, return northward to the col between the two summits. One may then bear to the left around the northern summit to the road by which we came up, or he may bear to the right and follow down the ridge on the eastern side of the mountain to logging roads running northward, and eventually leading to the mill already alluded to. We took the latter route. A drenching thunder shower (the same which played such freaks on the summit of Mt. Washington) proved not conducive to the taking of notes on the homeward stretch, and moreover, our actual time would hardly furnish the basis for a reasonable estimate.

THE GREAT GULF. BY W. H. PICKERING.

At the close of the Jackson field-meeting last summer, an excursion was organized to walk to the Glen House through Carter Notch. A large party took advantage of the opportunity, and many others went in wagons by way of the Pinkham Notch. For the next day, July 21, a number of us had planned the ascent of Mount Washington by way of the Great Gulf; but when we awoke in the morning we found it raining heavily, and concluded that we must abandon the trip. After a time, however, the rain ceased, and at length eight of us mustered up courage to try the ascent. We left the Glen House at 10.40 and, passing the toll-house, crossed a field and a piece of cultivated ground to two large bowlders, which appear as one from the hotel. Here entering the woods we followed the Mount Madison path to a sign-board, which was marked " $\frac{1}{2}$ mile." Near it we found a blazed trail leading off to the left, which we supposed was the one we were to take, but it merely led to a small stream, and there came to an end, so that we had to retrace our steps, losing thereby about half an hour. At 12.20 we came to the west branch of Peabody river,

and here the path divides, our route leading along its southern bank, while the Mount Madison trail crosses it, and ascends the opposite ridge. By 2 o'clock we came to a large island in the stream, and a few minutes later to three very pretty falls, where we stopped and dined. Continuing up stream a few minutes brought us to a fourth fall, and at length, at 3.15, we reached Spaulding's Lake, a distance of five miles from the Glen House.

This "lake" is about one hundred and fifty feet in length, by one hundred in width, and its waters looked like ink under the dense clouds which still hung low upon the mountains. It had rained heavily several times since we started, and we were all wet to the skin, but the exercise kept us warm, and we did not mind a little cold water. The slides rose steeply on all sides, and were quite near at hand as compared with those near Hermit Lake in Tuckerman's Ravine. On a clear day the view must be very impressive, but now the clouds shut out all but the lower spurs of the mountains. Shortly after passing the lake, our path came to an end, leaving us to choose between forcing our way through the tangled growth of alders, with which the bottoms of nearly all the great ravines are filled, or taking to the brook.¹ We chose the latter alternative, as the water was not more than six or eight inches deep, and we were already as wet as we well could be. After three-quarters of an hour the alders came to an end and we stood at the foot of one of the great slides which comes down the head wall of the ravine. Two routes were now open to us, either to follow up the slide to the head of the Gulf and strike the railroad, or to keep very far to the left, up the side of the ravine to the carriage-road. Most of the party preferred the latter course, which, however, it is not advisable to follow in the future. The time required from the foot of the slide to the edge of the ravine, was 1 h. 20 m.; thence by carriage road to the summit, 15 m. Total time, 6 h. 50 m. Total distance $7\frac{1}{4}$ miles. We stayed on the summit till 6.15, when three of us started down the carriage-road to the Glen House, where we arrived at 8.10 P. M., having had a very interesting but very rainy walk.

MTS. PASSACONAWAY AND WHITEFACE. BY W. H. PICKERING.

A few days after making the last-mentioned trip, a party of three, consisting of Professor Fay, Mr. Astley Atkins, and the writer, planned to make the ascent of Passaconaway from Shackford's, in the Swift River Valley, cross the col between this summit and Whiteface, and descend the latter by the path to McCrillis's in the town of Sandwich. Accordingly, July 27, we took the cars at Intervale for Conway Corner, where we arrived at 12 M., and then started to walk to Shackford's—distant about fifteen miles. We reached the Swift River Falls at 3.50,

¹ The path has since been continued through the growth.

having stopped to lunch on the way, and, after a short stay at the falls, continued on to our destination, where we arrived at 6 o'clock. Here we passed the night. Shackford's is the home and headquarters of the "midge" family, as one of us found to his cost. Early in the morning just after sunrise, in an unguarded moment he removed the double thickness of mosquito netting from his window to get a breath of the fresh morning air. Almost in an instant his room swarmed with the little pests, and it is his impression that the remainder of his toilet was completed in a space of about sixty seconds.

The bad weather we had encountered in the Great Gulf still pursued us, for the clear blue sky of the day before had been succeeded by a threatening mist, and little was to be seen of the mountains save their foot-hills. After a time, nevertheless, we decided to try the ascent. We left Shackford's at 8 A. M., and kept straight over the little wooded hill lying between it and Passaconaway. The underbrush was unusually bad, considering the large size of the trees, and we should have done better to have followed a cart path which leads around this foot-hill. On Passaconaway itself the walking was good, but just before reaching the summit the clouds shut down upon us, and it began to rain, which refreshing phenomenon was kept up with short intermissions until we reached Whiteface. The summit of Passaconaway is small and rather pointed, so that very little clearing would give quite a good view of what may now be seen partially through the trees; but to clear the whole summit would be an expensive undertaking. The col to Whiteface is broad and consists of a series of short, steep, up-and-down grades which are very tiresome to travel over. One rather curious incident occurred on the trip. A rabbit came racing through the bushes, and probably never having seen men before, perhaps mistook us for trees, for as I moved my leg forward to take a step, he ran directly against it with such force as to knock himself flat; in an instant, however, he was up again and away. The view from Whiteface is certainly very fine, and the great southern gorge down into which one looks is without an equal south of the Mount Washington Range. A good path leads down to McCrillis's, where we were hospitably entertained and our wet clothing exchanged for dry. The next day two of us drove over to the West Ossipee station, where we parted and I returned alone to Intervale. The approximated distance from Shackford's to Passaconaway is four miles; to Whiteface, six miles, McCrillis's, ten miles. Our party left Shackford's at 8 A. M.; reached the summit of Passaconaway at 12 M.; left at 1.10; reached a brook on the col at 1.40; reached Whiteface at 4.10; left at 6.10; reached McCrillis's at 7.10 P. M.

DISCOVERY OF A NATURAL CAMP IN KING'S RAVINE AND ASCENT OF
THE HEAD-WALL BY THE COURSE OF COLD BROOK. BY C. E.
FAY.

A SINGLE day passed at Jefferson Highlands, at the close of the Bethlehem field-meeting (September 11, 1881), came near being lost for any excursion by the threat of rain. Shortly after noon, however, having secured the companionship of Mr. C. E. Lowe, I set out from his house for my first visit to King's Ravine. So late a start suggested lively work and few rests, if even a superficial idea of the beauties and grandeur of the wonderful gorge were to be gained before sunset on a cloudy day so late in the season. It was thought that we might have time to scale the head-wall and descend by the Mount Adams path; for Mr. Lowe estimated that good walkers, by a steady pull, could reach the upper edge of the Ravine in four hours. His estimates of possible time underwent some change, however, when we found ourselves back at his cottage in less than six hours, having not only traversed the Ravine, but also having visited the summit of Adams, where we spent nearly half an hour, besides finding time to increase the sum of knowledge of the region by the items which it is the purpose of this note to put upon record.

Our walk as far as the boulders, though rapid, was a continual delight, the day being a perfect one for a ravine excursion. The cloudy canopy served but to enhance the grandeur of the rugged, bristling walls, and the mist-filtered light gave depth of tone and body to the colors of the scenery.

While sitting upon a prominent rock, the vidette of the huddled flock that almost fills the upper section of the Ravine, I noticed the water-course which descends the very precipitous western side of the head-wall. Mr. Lowe thought it had never been ascended,¹ and volunteered to be one of two to try its ascent. The temptation was too strong to be resisted, in the emboldening air of the place, and forthwith we started. The reward was success in our undertaking and the discovery of this unique rock-cave, which Nature seems to have formed for some earlier race, in an age more near the golden one than that which gave birth to Appalachians.

We were eight minutes in crossing the boulder region and reaching the point in the final patch of stunted timber at which we left the path and bore directly towards the reddish gash which was to be our line of ascent. We had been moving easily upward along an oblique line for twelve minutes more, and had nearly reached the brook, when an exclamation from Mr. Lowe announced something new. He was a few rods *in* advance, and had just emerged from the underbrush. On coming in sight of him, he was making for the opening of a sort of grotto just above on the steep slope, — a feature of our mountains which, for its uniqueness, remarkable location, and probable future utility, is worthy of being widely known to the lovers of mountain solitudes.

¹ It appears that Messrs. W. H. Pickering and W. S. Fenollosa have descended into the ravine by following down the general course of the brook.

It is on the face of a little buttress, or shoulder, that falls off to the right (as one faces upward) into the trough of the brook, and is made by an immense fragment of rock, — descended from above, — whose under surface, which forms the ceiling, is quite flat, while the upper side is embedded in and helps support a thickness of perhaps twenty-five feet of the grassy, slightly bushy slope, whose verdure creeps down almost to the opening. A rough measurement gave this grotto a width of fourteen feet, a height at the entrance of nearly six, and an average horizontal depth of about nine, — a size not far from that of the Club's camp on the Mount Adams path, though its capacity for accommodation is more limited. The floor inclines downward from the entrance, and is composed of large fragments of rock with deep crevices between. All that seems requisite to convert it into an available shelter for passing the night, is to fill these and cover the floor with hemlock boughs. A pretty feature, which a single night's camp-fire will destroy, is a bright patch of green lawn just at the entrance. There is just room for a camp-fire, and fire-wood may be obtained in the vicinity, while a moment's clamber down the rocks brings one to the inexhaustible supply of perhaps the coldest brook in the White Mountains (38° F.).

Enviably indeed seems the experience of those who shall occupy this rocky alcove, especially while nature immediately in the vicinity retains its present unmarred wildness. It will be much like camping in mid-air, for within six feet of the entrance the ground falls away so suddenly that from within it seems as if a single leap would be a flight into the woody depths of the Ravine which stretches in its full extent before you, if not, indeed, to the summit of the blue mountains which fill the northern horizon.

We tarried but a few moments to enjoy our discovery, and then continued our course. In a few moments we had reached the brook at a point beyond which, — whatever the travelling may be below, — its course must be followed upward by sheer dint of climbing. Mr. Lowe had allowed his dog to follow us. The protesting whines of the poor beast as he witnessed our departure up the rocky face, where canine feet could find no hold, were quite depressing; but, knowing that he could find his way home, he was abandoned to solitude. Mutual helpfulness was the *sine qua non* of progress for us, and Mr. Lowe, with a laughing good-grace, accepted for the first time that assistance for which so many have been indebted to him. It was a place where the factor of risk increased directly as the weight of the climber. Hence the lighter of the pair now and then could gain some "coigne of vantage," and, bracing firmly, reach down a helping hand. Honesty compels the confession that the vise-like grip of Mr. Lowe, under these circumstances, is something very different in its suggestions from the same grasp when he is in the ascendant. We had passed several such places when, to our surprise, we were rejoined by Fido. Whether he had compounded with the genii of the mountain for magic transportation, or, not putting a point of honor in ascending by the brook-bed, had found a simpler way, we did not learn

from him. Doubtless an easier ascent than that which we were pleased to persist in following might be made by taking detours here and there. In about fifty minutes after leaving the cave we reached the upper edge of the head-wall, exactly three hours from our start.

Our trip from here to the summit of Adams, and the descent, offered nothing worthy of special remark. Starr King has put upon record (The White Hills, page 360) the time of the first party known to have made the excursion through the Ravine before the days of our Club-paths. The following record of the time of our forced march may be of interest to some who are familiar with the ground. The rests (R) are indicated in minutes:—

Left Lowe's	12.20	Boulders (R. 5)	2.02
Ravine Path (2.25 km.)	1.00	Left the Path	2.15
Chandler's Cascade	1.20	Cave (R. 5)	2.27
Second Brook	1.34	Edge of Ravine (R. 10)	3.20
Cold Brook	1.38	Summit of Adams (R. 25)	3.50
Moss Cascade (R. 5)	1.42	A. M. C. Camp (R. 20)	5.10
Reached Lowe's			6.07

Reports of the Councillors for the Autumn of 1881.

Improvements.

By A. E. SCOTT.

THE amount of funds placed at the disposal of this department by the Council was so small that the projects suggested in the Spring report were not attempted, yet the demands on the time of the Councillor have been considerable.

Early in the season a week was spent in going over some of the important paths of the Club. The Thornton-Warren path was found in good condition from Thornton to a point about one mile beyond the camp. From this point to the highway in Warren it was somewhat blind and obstructed by logging operations during the winter. This part of the path was put in good condition, and doubtful points were marked by painted signs. A route to the top of Kineo was spotted from a point on the path about a mile north of the camp, and the summit was so far cleared as to afford a view in all directions.

The Tuckerman's Ravine path and camp required no outlay. The Mount Adams path from the summit to the forest was in an unsatisfactory condition. The cairns which were conspicuous when the path was first built, surmounted with fragments of quartz, were in many places demolished, the path difficult to follow and almost obliterated through the belt of low growth at the edge of the forest. Some work was done in improving this part of the path, but it cannot yet be regarded as safe for one unfamiliar with the ridge to attempt to follow. The covering of the camp was found in a dilapidated condition. The old bark was entirely removed and the frame very carefully recovered throughout. Considerable work was also done on the lower part of the path, in removing windfalls and the debris left by the logging teams. The path to the Ravine of the Cascades was found as well constructed as the nature of the locality would admit, only requiring travel over it to make it acceptable.

The Livermore-Waterville path was reported in bad condition, and later in the season a workman was sent over it to improve some of the worst places. This work merely made it passable for the rest of the season. Extensive logging operations are carried on over and across the eastern end of the path, and in other places the underbrush encroaches very rapidly. Early next season the path should be carefully repaired.

At the time of the Club excursion through Carter Notch, the path from the Notch to the Glen House was found somewhat obstructed. Arrangements were made with the proprietors of the Glen House to have the path properly cleared out later in the season; but the work does not appear to have been done, and should receive attention early next year.

The route from the snow-field in Tuckerman's Ravine to the summit of Washington has never been properly marked until this year. Mr. F. H. Burt, a member of the Club, assisted by Mr. W. D. Stevens, has done a good work by marking a feasible route by the use of paint. At the foot of the precipice, on a prominent rock, an arrow with the word "Summit" indicates the direction. From this point to the summit, white lines are painted on rocks at intervals of two rods, each line indicating

the direction of the next. This route will be measured and further improved by placing signs at the starting point on the summit, and in at least two other places.

At the meeting of the Club at Bethlehem members sojourning at Franconia urged the importance of a path to Bridal Veil Falls, so called, on Mount Kinsman. These falls were claimed as discovered two years ago, although they had long been known to residents in the vicinity, and one gentleman assured us he had been accustomed to conduct parties thither for upwards of forty years. This department engaged to see that the path was properly constructed before the close of the season, provided the requisite funds were raised by subscription. Miss M. J. Stone, of Framingham, took hold of the work with great energy, raised the required amount, and obtained rights of way or permission to pass over lands of various owners. In October we visited the locality and contracted for the work over a route marked out by us. The cutting is reported to us as finished, and little remains to be done by the Club save to grade in one or two places, more accurately measure, and properly mark the path. Sufficient funds remain for these purposes. Some of the residents in the vicinity have, however, become interested, and have promised to construct in the spring a way suitable for carriages over the first half of the route to the point where our cutting begins.

Starting from Horace Brooks's, on the road from Franconia to Easton, the route follows an old cart-path across an open field and through pine woods to an ancient clearing, thence across this clearing to the edge of the forest, close to Copper-Mine Brook. Here the Club path begins and follows the brook as closely as practicable on the northerly side until, about sixty rods from the falls, it crosses by a bridge of logs and follows the other side to the basin at the foot of the falls. From a point on the path a short distance below the basin, a detour is made by which the top of the falls may be reached and a fine view obtained. The distance from the highway to the foot of the falls is a little more than two and one half miles, — or, more accurately, $4\frac{1}{2}$ 4. The Kinsman Flume is not far from these falls, and is well worth a visit.

At the meeting of the Club held at the Glen House, attention was called to the impending destruction of the Old Man of the Mountain. The matter was referred to this department with instructions to take such steps as were feasible for its preservation. An examination was made in August, and a verbal report presented at the meeting in Bethlehem. The report was, briefly, that it is hardly possible to prevent the fall, at no very distant day, of large masses of rock from this part of the cliff, which will, possibly, entirely obliterate the profile; that the immediate danger is in the fall of a huge fragment of rock which has become detached and moved forward to the edge of the cliff, and of a larger mass upon which this rests, and which is separated from the ledge by a crevice from four to eight inches wide, upwards of forty feet long, and a number of feet deep. Into this crevice the water pours from the ledges above, and in one part it is filling with gravel. The sides of this crevice and the fragment above referred to are covered with lichens, showing that they were separated many years ago; but in that part of the crevice which seems to be filling with gravel the lichens are worn off, indicating recent action, and there is little doubt that the fragment has been gradually moving forward to its present position. It seemed to us, on our first visit, that it was important to prevent this crevice from filling, to avoid the action of frost, and possibly to make use of iron bands or chains in some places. The proprietors of the Profile House, who have a special interest in preserving the Old Face, expressed their readiness to do anything that was necessary for that purpose, and promised to give the matter attention later in the season.

It was our privilege to study the profile from a distance a number of times after our examination on the summit, and the more we studied it the more we became convinced that the rock referred to as poised upon the edge of the cliff is an important factor in the formation of the forehead. To become certain upon this point, and to further urge forward the promised steps towards preservation, in October we made another visit to the locality and again climbed to the summit.

While on or near the head, it is difficult to tell exactly what rocks or projections help to make up the features of the

profile, and it is hard to believe that the comparatively small fragment poised on the outer edge has anything to do with the majestic forehead ; but by following down the cliff, which we did, and coming out upon Profile Lake, the features gradually stand out from the great mass, and there is at length no doubt that the poised rock is the prominent part of the forehead. The inclination of the rock, and the angle at which it is seen no doubt tend to produce this effect.

We made such measurements as the gale blowing at the time would admit ; but Mr. C. E. Lummis, who has visited the summit a number of times, has furnished us with measurements claimed to be correct, some of which are as follows. The length of the forehead rock is 19 ft. 3 in. ; its dimensions at the larger end are 5 ft. 5 in. by 4 ft. 5 in. ; at the smaller end 3 ft. 9 in. by 4 ft. 3 in. The upper or smaller end projects beyond its support over the edge of the cliff 4 ft. 10 in. The rock is moved forward from the part from which it was split, making a cleft varying in width from end to end from $2\frac{1}{2}$ to nearly 6 ft. Into this cleft a number of large rocks have fallen from the ledges above.

There is no doubt that the centre of gravity of this forehead rock is now firmly supported, and it may remain so for generations ; but it seems to be so carefully poised that it is hardly possible to avoid the feeling that a slight jar may hurl it from its support, and it is not pleasant to contemplate that, by the fall of a single rock, the semblance of majestic intellect will probably disappear, and that in its place we shall see a low, sloping forehead, with possibly an idiotic expression.

It is difficult to decide what, if anything, can be done which will tend to its preservation ; but we again urged the proprietors of the Profile House to attempt at least to avert in some measure the powerful action of frost, and received renewed assurances that the matter should receive immediate personal attention. We have since received a very cordial communication stating that an examination had been made, and that the rocks appeared to be in the same position that they were in fifteen years ago, and that they would leave the future care of the Old Face to Him who had preserved it so many years. With due respect to this testimony, we cannot help expressing

the opinion that the evidence of others who have visited the forehead year after year, and of the careful measurements taken at different times, is more reliable.

At the Bethlehem meeting the project of cutting a path along the ridge of the Twin Mountain Range was referred to this department. The project was suggested so late in the season that it was not possible to raise sufficient funds to warrant the beginning of the work.

The Club instructed this department to remove the original records from the bottles on mountain summits for preservation, and to replace them with copies. In accordance with this vote, the records have been removed from Kineo, Jefferson, Adams, Madison, King's Ravine, Camp on Mount Adams, Carter Dome, and Moat. In some instances copies have been left in the bottles; in other cases the records were so long, and the difficulties of copying on the summits so great, that this was not done. In some places the copies of the record will more than fill the bottles, and it is possible the Club may find it expedient to modify its vote regarding them. The records are in such condition that it seems important to have them extended in a book for their preservation.

The glass record-bottle on Mount Madison has been replaced by a metal one, the records in the former being found in a wet and illegible condition. It is reported that the record-bottle on Moat was ingloriously hurled down the mountain side by an intelligent visitor, who supposed it to be an infernal machine placed there for some diabolical purpose. Fortunately the record had been removed a day or two before, and is preserved. A new bottle has been placed upon this summit.

In connection with our mountain work, it is pleasant to be able to mention improvements made by others. The White Mountain Club of Portland has, during the year, marked by painted signs a route from the old schoolhouse near Echo Lake, at North Conway, to the Location Pasture, and thence to Thompson's Falls, to which locality attention was called in a former report of this department.

Proceedings of the Club.

December 15, 1881 (Evening).—Thirty-fourth Corporate Meeting.

President Fay in the chair.

Twelve candidates for membership were nominated, and those presented at the last meeting were all elected.

Professor Fay, for the committee on a winter excursion, announced that arrangements were being made for such an excursion, to Jackson, N. H.

Messrs. W. H. Ladd, S. W. Holman, and Chas. A. Wellington were appointed a committee to make nominations for officers to be elected at the next meeting.

The Corresponding Secretary read a letter received from the Alpenclub Oesterreich requesting an interchange of publications and the establishment of friendly intercourse between their society and ours; also an announcement of the International Alpine Congress to be held at Salzburg in August, 1882; also a letter from the President of the Siebenbürgischer Kampathenverein requesting that this Club take notice of its foundation and pursuits, and asking for an interchange of publications.

Mr. A. E. Scott presented his report as Councillor of Improvements. (See p. 76.)

Mr. Samuel Adams Drake read a paper giving an account of a winter excursion to the White Mountains a few years ago, including a ride through the White Mountain Notch.

January 11, 1882.—Thirty-fifth Corporate Meeting.

President Fay in the chair.

Eight candidates for membership were nominated, and those presented at the last meeting were all elected.

Professor Fay, for the Printing Committee, announced the issue of APPALACHIA, II. 4, completing the volume.

The Recording Secretary presented his report for the year. (See p. 60.)

Mr. J. R. Edmands made his report as Corresponding Secretary.

Mr. C. W. Kennard presented his report as Treasurer. (See p. 62.)

The following officers for the ensuing year were then elected by ballot, in accordance with the recommendation of the Committee on Nominations: President, Wm. H. Niles; Vice-President, Gaetano Lanza; Recording Secretary, Rest F. Curtis; Corresponding Secretary, Charles E. Fay;

Treasurer, Charles W. Kennard ; Councillors : Natural History, Charles E. Hamlin ; Topography, J. Rayner Edmands ; Art, Miss Susan Hale ; Exploration, William H. Pickering ; Improvements, A. E. Scott.

President Niles took the chair. The retiring President then delivered the annual address (See p. 1.), his subject being American Geographical Nomenclature.

Mr. W. H. Pickering exhibited and described a new form of small portable camera, weighing about two pounds, made by W. W. Walker of Rochester, N. Y., and suitable for taking views while on pedestrian tours.

On Tuesday evening, Jan. 17, 1882, the Club held its third annual reception at the Hotel Vendome. About one hundred and twenty-five ladies and gentlemen were present, and the evening was pleasantly passed in social intercourse, varied with music and a collation.

On Feb. 1, 1882, the Club made its first winter excursion, lasting three days, visiting Jackson, N. H., including a railroad ride through the White Mountain Notch to Fabyan's, a sleigh-ride, and an ascent of Thorn Mountain. (See p. 40.)

February 8, 1882.—Thirty-sixth Corporate Meeting.

President Niles in the chair.

Twelve candidates for membership were nominated, and those presented at the last meeting were all elected.

The matter of the removal of records from the Club bottles on mountain summits, and replacing them with new ones, was referred to the Council, with full powers.

Rev. W. A. Start read a paper on Camden, Me., its mountains and lakes.

Mr. John Ritchie, Jr., for the committee on winter excursions, presented a formal report of that excursion. The report was accepted.

A vote of thanks to Mr. M. C. Wentworth of Jackson, N. H., for his thoughtful kindness in providing for the comfort of the party, was passed; also one to the Eastern and the Portland & Ogdensburgh Railroads, for favors shown on the same occasion.

Mr. S. W. Holman read a paper on some hypsometric measurements at Williamstown, Mass. (See p. 40.)

Mr. J. Ritchie, Jr., read four letters, giving a detailed and interesting account of the excursion to Jackson.

Mr. S. H. Scudder gave an account of an expedition made by himself and Mr. J. R. Edmands, in connection with the winter excursion, including an ascent of Thorn Mountain.

Mr. Edmands spoke of some advisable preparations for climbing in the snow.

March 9, 1882 (Evening).—Thirty-seventh Corporate Meeting.

President Niles in the chair.

Twenty-two candidates for membership were nominated, and those presented at the last meeting were all elected.

Professor Maria Mitchell of Poughkeepsie, N. Y., was nominated for corresponding membership.

Professor George L. Vose spoke on the relation of mountains to the construction of railways, illustrating his remarks by diagrams of many difficult and curious pieces of railroad engineering in Europe and America.

The Corresponding Secretary, Professor Fay, spoke of the development of Alpine literature in Europe, its extent, and the general character of the publications of Alpine clubs and geographical societies, presenting at the same time, in illustration, copies of the exchanges received from the societies with which the Club is in correspondence. These included the proceedings of seven geographical societies,—those located at London, Berlin, St. Petersburg, Antwerp, Bordeaux, Lisbon, and Cairo,—and the bulletins, or other issues, of fourteen Alpine societies, viz. : The Alpenclub Oesterreich; the Associació d'Excursions Catalana; the Club Alpin Française,—sections des Alpes Maritimes, d'Auvergne, de Saône et Loire, Lyonnaise, du Sud-Ouest; the Club Alpino Italiano,—the Direzione Centrale, and the Sezione Fiorentina; the Club Alpin Suisse, Section Genevoise; the Deutscher und Oesterreichischer Alpenverein; the Norske Turistforening; the Oesterreichischer Touristen-Club, and the Siebenbürgischer Karpathenverein. Special mention was made of the activity of the Italian Alpine Club, in this department, and extracts of special interest to the audience, as showing how the work of our own society is regarded abroad, were read from a recent number of its "Bollettino." The Associació d'Excursions Catalana, located at Barcelona, Spain, was spoken of as peculiarly interesting from its wide field of interests, and the use of the Catalan as its official language; and an extract was read from the report of Señor Arabía y Solanas upon Alpine bibliography, where pleasant mention was made of the Appalachian Mountain Club.

The President exhibited and explained a curious and interesting map of Japan on porcelain, which had recently been presented to the Institute of Technology.

April 12, 1882.—Thirty-eighth Corporate Meeting.

President Niles in the chair.

Seventeen candidates for membership were nominated, and those presented at the last meeting were all elected.

Professor Niles, for the excursion committee, announced that the May walk would occur on the afternoon of Saturday, May 20, visiting Breakheart Hill, in Saugus.

Professor G. Frederick Wright of Oberlin, Ohio, made an address, giving a detailed and interesting account of a hunt for the terminal moraine in Pennsylvania, illustrated by a large map of the region.

The President exhibited and described a large new map of the United States, published at Washington, by the Department of the Interior, which had just been presented to the Club.

Vice-President Lanza then took the chair, and a communication from President Niles was read, announcing his resignation of the office of president,—in accordance with a possibility stated by him at the time of his accepting the office,—the resignation to take effect in June.

Professor C. E. Fay, Colonel C. W. Folsom, and Dr. W. B. Parker were appointed a committee to nominate a candidate to fill the vacancy.

May 12, 1882 (Evening). — Thirty-ninth Corporate Meeting.

President Niles in the chair.

Mr. W. H. Pickering was appointed Secretary *pro tempore*.

The following amendments to the By-Laws were proposed, and the Club was asked to take action in regard to the same:—

I. Strike out the word "two" before "dollars" from Art. III., and insert the word "three" in place thereof.

II. Strike out the whole of Art. VI., and insert in place thereof the following: "Art. VI. The Recording Secretary shall be the Clerk of the Corporation, and shall keep a record of all the proceedings of the Club and Council, give notice to the members of the time and place of meetings, have charge of the muniments of title and the corporate seal, and shall present at the annual meeting a history of the Club during the previous year."

III. Amend Art. VII. so that it shall read as follows: "Art. VII. The Corresponding Secretary shall conduct the official correspondence of the Club; shall keep proper files and records of the same; shall have charge of the library; and shall make a report for the previous year at the annual meeting."

IV. Strike out the word "two" before "dollars" from Art. XIII., and insert the word "three" in place thereof.

Amendments II. and III. were passed to a second reading. After some discussion, it was voted to defer action on I. and IV. until the next regular meeting.

Mr. W. M. DAVIS read a paper on the Little Mountains East of the Catskills. (See p. 20.)

The report of Mr. J. B. HENCK, Jr., the delegate of the Club to the Alpine Congress, held at Milan last summer, was read by the Corresponding Secretary. (See p. 13.)

The same also read a paper by Mr. Henry L. Stearns, entitled "An Ascent of Pike's Peak." (See p. 33.)

By-Laws of the Corporation.¹

ARTICLE I. The Corporation shall be called the APPALACHIAN MOUNTAIN CLUB.

ART. II. The objects of the Club are to explore the mountains of New England and the adjacent regions, both for scientific and artistic purposes; and, in general, to cultivate an interest in geographical studies.

[The foregoing articles, forming a part of the Agreement of Association, can be changed only by Act of Legislature.]

ART. III. Elections to membership shall be made by ballot, and the candidates may be voted for on one ballot; the affirmative votes of at least two thirds of the members present and voting shall be necessary to election. Nominations shall be made in writing by at least two members, and forwarded to the Council. Should the Council approve the nomination, it shall be announced at the next regular meeting, and balloting shall take place at the succeeding regular meeting. Each candidate elected shall pay an admission fee of two dollars, and subscribe assent to these By-Laws within six months after the election, otherwise the election of such candidate shall be void.

ART. IV. The officers of the Club shall be a President, Vice-President, Recording Secretary, Corresponding Secretary, Treasurer, and five Councillors. These officers shall form a governing board to be termed the Council.

ART. V. The officers shall be chosen by ballot at the annual meeting, may be voted for on one ballot, and shall hold their offices until the next succeeding annual meeting, and until their successors are chosen in their stead; but any vacancy may be filled by a new election in the same manner, at any regular meeting, five days notice of the election having been given. The President and Vice-President shall not be eligible for two consecutive years, nor the Councillors for more than three consecutive years in the same department.

ART. VI. The President, or in his absence the Vice-President, shall preside at all meetings of the Club and Council; and, at the

¹ Proposed amendments now pending will be found in the Proceedings of the May meeting, page 85.

annual meeting, the President shall deliver an address upon some appropriate subject.

ART. VII. The Recording Secretary shall be the Clerk of the Corporation, and shall keep a record of all the proceedings of the Club and Council, give notice to members of the time and place of meetings, have charge of the library, pictures, documents, muniments of title, and the corporate seal; and shall present, at the annual meeting, a history of the Club during the previous year. The Corresponding Secretary shall conduct the official correspondence of the Club, shall keep proper files and records of the same, and shall make a report for the previous year at the annual meeting.

ART. VIII. The Treasurer, under the direction of the Council, shall collect, take charge of, and disburse all funds belonging to the Club, keep proper books of account, and at the annual meeting, and at other times when required by the Club, present a report of its financial condition.

ART. IX. All official notices by the Recording Secretary and Treasurer shall be given personally, or by mail, according to their best knowledge of the post-office addresses of the members.

ART. X. The five Councillors shall be chosen to represent, severally, the departments of Natural History, Topography, Art, Exploration, and Improvements. It shall be their duty to offer to the Council each spring a plan for the summer's work, and at the November meeting, to report to the Club the work accomplished in their respective departments during the preceding summer. The Councillors are authorized, when they think it expedient, to call special meetings of those interested in their respective subjects, at which they shall act as Chairmen.

ART. XI. The Council shall be the managing board of the Club. control all expenditures, make rules for the use of its property, and act for its interests in any way not inconsistent with these By-Laws; but shall have no power to subject the corporation to any liability beyond the amount of the corporate funds.

ART. XII. The Council shall call a regular meeting of the Club in Boston in each month, excepting July, August and September; also, special and field meetings at such times and places as may seem advisable. The January meeting shall be the annual meeting, and shall be held on the afternoon of the second Wednesday of that month, Eleven members shall form a quorum for business.

• ART. XIII. Each member shall be subject to an annual assessment of two dollars, due at the annual meeting; but no assessment other than the admission fee shall be required of any member during the six months succeeding his election. Members whose assessments are six months in arrears shall have notice of the fact sent to them by the Treasurer. Members who shall have neglected to pay an assessment for more than one year, and who shall continue such neglect for more than one month after notice referring to this article shall have been sent to them by the Treasurer, shall thereupon cease to be members, which fact, in each case, shall be certified in writing by the Treasurer to the Recording Secretary, who shall enter it of record; but such membership may be revived by the Council in its discretion, upon payment of past dues. The President and Treasurer are authorized to remit any fee, *sub silentio*, when they deem it advisable.

ART. XIV. Any person elected to membership in the Corporation may become a life member upon payment of thirty dollars, and shall thereafter be subject to no fees or assessments of any kind. All moneys so received, together with such other sums as may be received or appropriated for permanent investment, shall be securely and separately invested by the Treasurer, as a Permanent Fund, the income only of which shall be expended.

ART. XV. The Club may elect Corresponding Members in the manner prescribed for the election of members of the Corporation, excepting that the Council only shall nominate; and from among the Corresponding members it may elect in the same manner Honorary Members, not to exceed twenty-five in number; but Corresponding and Honorary Members shall not be (technically) members of the Corporation, nor be subject to any fees or liabilities whatever.

ART. XVI. These By-Laws are fundamental, and shall not be altered, amended, suspended, or repealed, in the whole or in part, except by a vote to that effect of at least three fourths of the members present and voting at two consecutive regular meetings of the Club, notice of the proposed change having been sent to all the members.

OFFICERS FOR 1882.

President,

Prof. WILLIAM H. NILES, Cambridge, Mass.

Vice-President,

Prof. GAETANO LANZA, Mass. Inst. of Technology, Boston, Mass.

Recording Secretary,

REST F. CURTIS, 16 Beethoven St., Jamaica Plain, Mass.

Corresponding Secretary,

Prof. CHARLES E. FAY, College Hill, Mass.

Treasurer,

CHARLES W. KENNARD, 30 Chestnut St., Boston, Mass.

Councillors :

Natural History, Prof. CHARLES E. HAMLIN, Museum Comparative Zoology, Cambridge, Mass.

Topography, J. RAYNER EDMANDS, Harvard College Observatory, Cambridge, Mass.

Art, Miss SUSAN HALE, 64 Boylston St., Boston, Mass.

Exploration, WILLIAM H. PICKERING, Mass. Inst. of Technology, Boston, Mass.

Improvements, A. E. SCOTT, 95 Milk St., Boston, Mass.

Members of the Corporation.

May 27, 1882.

Adams, Edward L., Boston, Mass.	Allen, Frederic D., Cambridge, Mass.
Addey, Markinfield, New York City.	
Agassiz, Alex., Cambridge, Mass.	† Allen, J. A., Cambridge, Mass.
Agnew, Miss Mary, Orange Valley, N. J.	Ames, Charles H., Boston, Mass.
Alden, Miss A. Fanny, Hingham, Mass.	Andrews, Miss A. B., Salem, Mass.
	Andrews, Miss A. P., Boston, Mass.
Alden, W. E., Boston, Mass.	Anthony, Alfred W., Providence, R. I.
Alexander, Eben., Boston, Mass.	Anthony, Gardner C., Providence, R. I.
Alexander, Winthrop, Roxbury, Mass.	
Allen, Edward F., Medford, Mass.	Atkins, Edwin F., Boston, Mass.
Allen, Fredk. B., Boston, Mass.	Atkins, Mrs. Elisha, Boston, Mass.
	Atwood, E. S., Salem, Mass.

Those whose names appear in capitals are Life Members. † Original Members.

- Frothingham, Miss M. A. J., Malden, Mass.
 Frye, Miss Mary P., Boston, Mass.
 Gamble, James H., North Conway, N. H.
 Gardiner, Frederic, Jr., Cambridge, Mass.
 George, Frank, Upper Bartlett, N. H.
 Glover, Luther W., Medford, Mass.
 Goodale, Alfred M., Newton, Mass.
 Goodrich, Arthur L., Salem, Mass.
 Gould, Arthur F., Lexington, Mass.
 Gould, Miss S. B., Lexington, Mass.
 Gray, Francis C., Boston, Mass.
 Green, Miss H. E., Boston, Mass.
 Gregory, Mrs. Mary Cambridgeport, Mass.
 Groce, Byron, Roxbury, Mass.
 Guild, Chester, Boston, Mass.
 Gunnison, Almon, Brooklyn, N. Y.
 Hagar, Eugene B., Boston, Mass.
 Hale, Arthur, Roxbury, Mass.
 Hale, Edward E., Roxbury, Mass.
 Hale, Geo. S., Boston, Mass.
 Hale, Miss Susan, Boston, Mass.
 Hamlin, Chas. E., Cambridge, Mass.
 Hammond, George F., Boston, Mass.
 Hammond, George W., Boston, Mass.
 Hammond, Mrs. Geo. W., Boston, Mass.
 Harrington, Miss Elizabeth W., Lexington, Mass.
 Harrington, Miss Elvira M., Boston, Mass.
 Harris, Mrs. Abbie F., Lynn, Mass.
 Hasbrouck, J. Howard, Boston, Mass.
 Hawes, Miss Charlotte W., Boston, Mass.
 Haynes, Henry W., Boston, Mass.
 Heath, Daniel C., Boston, Mass.
 Hedges, Sidney M., Boston, Mass.
 Henck, John B., Boston, Mass.
 † HENCK, J. B., Jr., Boston, Mass.
 Higginson, T. W., Cambridge, Mass.
 Hill, H. A., Hyde Park, Mass.
 Hill, Mrs. H. A., Hyde Park, Mass.
 Hill, Miss Hattie A., Belmont, Mass.
 Hill, James W., Salmon Falls, N. H.
 Hill, J. Edward R., Boston, Mass.
 Hill, Miss Mary H., Hyde Park, Mass.
 † Hitchcock, C. H., Hanover, N. H.
 Hitchings, E. H., Boston, Mass.
 Hitchings, Miss Helen M., Boston, Mass.
 Hoag, Gilbert C., Boston, Mass.
 Hodges, Walter W., Boston, Mass.
 † Holden, Luther L., Boston, Mass.
 Hollingsworth, Miss Rose, Mattapan, Mass.
 Hollingsworth, Sumner, South Braintree, Mass.
 † Holman, Silas W., Boston, Mass.
 Hopkins, Miss Maude G., Boston, Mass.
 Horsford, Bradley, Springfield, Mass.
 Howard, Charles P., Hartford, Conn.
 Howell, Selah, Watertown, Mass.
 Hubbard, Lucius L., Cambridge, Mass.
 Hunt, Freeman, East Cambridge, Mass.
 † Hunt, T. Sterry, Montreal, P. Q.
 Hunting, Miss M. A., Boston, Mass.
 Huntington, Austin, New York City.
 † Huntington, J. H., Hyde Park, Mass.
 Hyatt, Alpheus, Boston, Mass.
 Inches, Geo. B., Boston, Mass.
 Ingalls, Miss Maria A., Boston, Mass.
 Ireson, Miss Helen M., Lynn, Mass.
 Jenks, Charles W., Boston, Mass.
 † Jenney, Walter, South Boston, Mass.
 Jones, Gardner M., Boston, Mass.
 Jones, Harry W., Shelburne Falls, Mass.
 Jones, R. Ralston, Chicago, Ill.

- Joslin, Miss Rebecca R., Boston, Mass.
 Josselyn, Miss Lizzie J., Boston, Mass.
 Keith, Herbert F., Great Barrington, Mass.
 Kendall, Joshua, Cambridge, Mass.
 Kendall, Mrs. Joshua, Cambridge, Mass.
 Kennard, Chas. W., Boston, Mass.
 Kennedy, George G., Boston, Mass.
 Kingman, A. A., Brookline, Mass.
 Kingman, Mrs. A. A., Brookline, Mass.
 Kinnicutt, L. P., Worcester, Mass.
 Knapp, Arthur M., Boston, Mass.
 Knight, Miss Mary P., New York City.
 Knowles, Miss M. A., Boston, Mass.
 Knowlton, W. J., Boston, Mass.
 Ladd, Miss Emily J., Boston, Mass.
 Ladd, Wm. H., Boston, Mass.
 Lane, Chas. A., Hingham, Mass.
 Jane, William C., Cambridge, Mass.
 † Lanza, Gaetano, Boston, Mass.
 Lanza, Miss M. P., Boston, Mass.
 Lawrence, Miss A. W., Boston, Mass.
 Lawrence, Rosewell B., Medford, Mass.
 Lawrence, Samuel W., Medford, Mass.
 Learned, Miss Georgie D., Boston, Mass.
 Lee, Mrs. F. H., Salem, Mass.
 Lincoln, Mrs. C. D., College Hill, Mass.
 Lincoln, Miss Lizzie D., College Hill, Mass.
 Lincoln, Miss R. M., Brimfield, Mass.
 Litch, John G., Boston, Mass.
 Littlehale, Miss Mary F., Boston, Mass.
 Lockwood, Samuel, Freehold, N. J.
 Lodge, Miss K. L., Boston, Mass.
 Lombard, Miss Annie S., Boston, Mass.
 Loring, Miss Fanny L., Brookline, Mass.
 Lowe, Chas. E., Randolph, N. H.
 † Mann, G. C., Jamaica Plain, Mass.
 Martin, Mrs. C. B., Boston, Mass.
 Martin, Miss Harriet L., Salem, Mass.
 McEntee, Jervis, Rondout, N. Y.
 McKaye, Mrs. M. E., Cambridge, Mass.
 McNicol, J. A., Lincoln, Vt.
 Merriam, M. H., Lexington, Mass.
 Merriam, Mrs. M. H., Lexington.
 Miller, Mrs. C. H., Boston, Mass.
 Miller, Miss Sarah E., Chelsea, Mass.
 Mitchell, Henry, Roxbury, Mass.
 Moor, C. R., Cambridge, Mass.
 Moor, Miss J. E., Cambridge, Mass.
 Moore, Alexander, Boston, Mass.
 † Morse, Edward S., Salem, Mass.
 † Morse, Geo. F., Portland, Maine.
 Moses, Miss L. T., Roxbury, Mass.
 Munroe, Miss Emma F., East Cambridge, Mass.
 Murdoch, John, Roxbury, Mass.
 Murdock, Harold, Boston, Mass.
 Neal, Miss Caro. F., Charlestown, Mass.
 Neal, Geo. B., Charlestown, Mass.
 Newhall, Miss Lucy M., Boston, Mass.
 Nichols, Harry P., Brunswick, Me.
 Nichols, W. R., Roxbury, Mass.
 Nichols, Mrs. W. R., Roxbury, Mass.
 † Niles, Wm. H., Cambridge, Mass.
 Niles, Mrs. W. H., Cambridge, Mass.
 Norcross, S. G., North Conway, N. H.
 Norton, Edward E., Boston, Mass.
 † Nowell, Wm. G., Wilmington, Del.
 Nunn, Miss Emily A., London, Eng.
 Oliver, Mrs. Grace A., Boston, Mass.
 Ordway, John M., Boston, Mass.
 Ordway, Lucius P., Providence, R. I.
 Ordway, Samuel H., Cambridge, Mass.

- Osborne, George A., Boston, Mass.
 Owen, Fred. W., Morristown, N. J.
 Page, Eben B., Boston, Mass.
 Page, Miss Edith, Boston, Mass.
 Page, Hollis B., Boston, Mass.
 Page, Mrs. Susan H., Boston, Mass.
 Palmer, Frederic N., Boston, Mass.
 Parker, Charles W., Boston, Mass.
 Parker, Frank W., Roxbury, Mass.
 Parker, Henry A., North Conway, N. H.
 Parker, Miss Mary, Boston, Mass.
 Parker, Wilbur B., Boston, Mass.
 Parsons, Miss Martha, Boston, Mass.
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 Peirce, Miss G. H., Boston, Mass.
 Peirce, Miss Mary E., Boston, Mass.
 Peirce, Miss Mary F., Cambridgeport, Mass.
 Phelps, Mrs. Arthur D., Boston, Mass.
 Pickering, Mrs. Edward, Boston, Mass.
 †Pickering, E. C., Cambridge, Mass.
 Pickering, Mrs. E. C., Cambridge, Mass.
 †PICKERING, W. H., Boston, Mass.
 Pickman, Dudley L., Boston, Mass.
 Pitman, Miss H. M., Somerville, Mass.
 Plimpton, Chas. T., Boston, Mass.
 Plimpton, Mrs. F. P., Roxbury, Mass.
 Pollock, Charles, Boston, Mass.
 Pollock, Miss Laura M., Roxbury, Mass.
 Porter, Miss Elizabeth B., Boston, Mass.
 Porter, Miss Juliet, Worcester, Mass.
 Porter, Miss Laura M., Boston, Mass.
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 Preston, Howard W., Providence, R. I.
 Prince, John T., Waltham, Mass.
 Proctor, Henry H., Boston, Mass.
 †Putnam, F. W., Cambridge, Mass.
 Pychowska, Mrs. Lucia D., Hoboken, N. J.
 Pychowska, Miss Marian M., Hoboken, N. J.
 Quimby, E. T., Hanover, N. H.
 Ramsay, Perley A., Boston, Mass.
 Ramsay, Mrs. Chas. H., Boston, Mass.
 Rand, Edw. A., South Boston, Mass.
 Rice, Miss E. M., Chelsea, Mass.
 Rice, H. M., Providence, R. I.
 Rice, William N., Middletown, Conn.
 Richards, C. A. L., Providence, R. I.
 Richards, Robert H., Boston, Mass.
 Ridler, C. E., Kingston, Mass.
 Ripley, Charles, Boston, Mass.
 Ritchie, John, Jr., Boston, Mass.
 Ritchie, Miss M., Boston, Mass.
 Robinson, Miss Frances M., Lexington, Mass.
 Rockwell, Geo. P., New Haven, Conn.
 Rogers, John K., Boston, Mass.
 Rogers, William B., Boston, Mass.
 Rollins, Wm. Herbert, Boston, Mass.
 Russell, Levi W., Providence, R. I.
 Ryder, Miss Annie H., Medford, Mass.
 SAFFORD, Dr. MARY J., Boston, Mass.
 Sanderson, Chas. W., Boston, Mass.
 †Saunders, Charles G., Lawrence, Mass.
 Savary, John, Washington, D. C.
 Sawtelle, Miss Ellen C., Roxbury, Mass.
 Sawyer, Edmund F., Newton, Mass.
 Sawyer, Edward, Newton, Mass.
 Sawyer, J. H., Boston, Mass.
 Sawyer, Mrs. L. A., Boston, Mass.

- Schouler, James, Boston, Mass.
 Schouler, Mrs. James, Boston, Mass.
 Scott, Augustus E., Lexington, Mass.
 † SCUDDER, SAMUEL H., Cambridge, Mass.
 Sears, Miss Ellen V., Boston, Mass.
 Seaver, Henry E., St. Louis, Mo.
 Sewall, Albert C., Williamstown, Mass.
 Sewall, Jas. W., Old Town, Maine.
 SHAW, BENJ. F., Lowell, Mass.
 Sheppard, Samuel A. D., Newton, Mass.
 Shippin, Edward, Philadelphia, Pa.
 Skinner, Mrs. E. G., Boston, Mass.
 Spalding, F. R., Boston, Mass.
 SPARKS, Mrs. JARED, Cambridge, Mass.
 Spaulding, Henry G., Springfield, Mass.
 Spaulding, Randall, Montclair, N. J.
 Stafford, F. I., Newfoundland.
 Starr Theodore, Philadelphia, Pa.
 Start, Mrs. Lena C., North Cambridge, Mass.
 Start, William A., North Cambridge, Mass.
 Stearns, Chas. A., Charlestown, Mass.
 Stearns, Mrs. C. A., Charlestown, Mass.
 Stevens, A. W., Cambridge, Mass.
 Stevens, Miss N. M., North Cambridge, Mass.
 Stimpson, J. K., Jr., Boston, Mass.
 Stimpson, Miss Kate F., Boston, Mass.
 Stimpson, Thomas M., Peabody, Mass.
 Stone, Miss Ellen A., East Lexington, Mass.
 Stone, Miss M. Isabella, Framingham, Mass.
 Strong, Geo. A., New Bedford, Mass.
 Swan, Mrs. W. W., Dorchester, Mass.
 Sweetser, Edwin C., Philadelphia, Pa.
 † Sweetser, M. F., Boston, Mass.
 Talbot, Miss Edith, Boston, Mass.
 Talbot, Miss Marion, Boston, Mass.
 Tallman, Henry C., New York City.
 Tappan, Lewis Wm. Jr., Boston, Mass.
 Thompson, Alexander R., New York City.
 Thompson, Edgar B., Woburn, Mass.
 Thompson, Leonard, Jr., Woburn, Mass.
 Tilden, Miss Maria D., Cambridge, Mass.
 Tillinghast, C. B., Boston, Mass.
 Tillson, Henry F., Cambridge, Mass.
 Townsend, Mrs. Edward B., Roxbury, Mass.
 Tucker, Gilman H., New York City.
 Tuckerman, Leverett S., Salem, Mass.
 Tufts, Miss Abbie B., Charlestown, Mass.
 Tuttle, Julius H., Dedham, Mass.
 Tuttle, Mrs. J. H., Dedham, Mass.
 Upham, Warren, Nashua, N. H.
 Upton, Miss Elizabeth, Boston, Mass.
 Verne, Bennard P., Boston, Mass.
 Vogl, Mrs. Susie C., Boston, Mass.
 VOSE, Miss MARY L., Providence, R. I.
 Waite, C. L., Orange, Mass.
 † Walling, H. F., Washington, D.C.
 Ware, Wm. R., New York City.
 Warren, Henry P., Plymouth, N. H.
 Weeks, T. W., Brooklyn, N. Y.
 Welch, Miss O. Augusta, Boston, Mass.
 Weld, Miss H. M., Jamaica Plain, Mass.
 Wellington, Miss Caroline, East Lexington, Mass.
 Wellington, Chas. A., Boston, Mass.

- Wellington, Cornelius, Lexington, Mass.
 Wellington, Miss Eliza, East Lexington, Mass.
 Wells, James A., Cambridge, Mass.
 Wells, Samuel, Boston, Mass.
 † Wells, Webster, Boston, Mass.
 Wentworth, M. C., Jackson, N. H.
 West, Arthur W., Salem, Mass.
 Whitaker, Channing, Boston, Mass.
 Whitaker, Mrs. Channing, Boston, Mass.
 Whitman, Edmund B., Cambridge, Mass.
 Whitman, Miss Kate, Lexington, Mass.
 Whitman, Miss M. F., Lexington, Mass.
 Whitney, Miss L. Louise, Watertown, Mass.
 Whitney, Solon F., Watertown, Mass.
 Whitridge, R. B., Boston, Mass.
 Whittier, J. A., Boston, Mass.
 Wilde, Miss Kate, Boston, Mass.
 Wilkinson, Mrs. Arthur, Cambridge, Mass.
- Willard, Joseph, Boston, Mass.
 † Williams, Francis H., Boston, Mass.
 Williams, Miss M. F., Cambridgeport, Mass.
 Winslow, Wm. C., Boston, Mass.
 Willson, Robert W., Cambridge, Mass.
 Wilson, Edw'd L., Philadelphia, Pa.
 Wilson, J. M., Charlestown, Mass.
 Winship, A. E. Somerville, Mass.
 Wolcott, Mrs. H. L. T., Dedham, Mass.
 Woodbridge, S. H., Boston, Mass.
 Woodbury, Chas. L. Boston, Mass.
 Woods, Andrew, Winchester, Mass.
 † WORCESTER, JOHN, Newtonville, Mass.
 Worcester, Mrs. John, Newtonville, Mass.
 WORCESTER, WILLIAM L., Newtonville, Mass.
 Worthen, T. W. D., Hanover, N. H.
 Wright, G. Frederick, Oberlin, Ohio.
 Wright, T. F., Bridgewater, Mass.

HONORARY MEMBERS.

- Daly, Charles P., New York City.
 Dana, James D., New Haven, Conn.
 Guyot, Arnold, Princeton, N. J.
 Hall, James, Albany, N. Y.
 * Henry, Joseph, Washington, D.C.
 Malte-Brun, Victor Adolphe, Paris, France.
- * Petermann, A., Gotha, Germany.
 Rawlinson, Sir Henry, London, England.
 Selwyn, A. R. C., Ottawa, Canada.
 Tuckerman, Edward, Amherst, Mass.
 Tyndall, John, London, England.

* Deceased.

APPALACHIA.

VOL. III.

BOSTON, APRIL, 1883.

No. 2.

Mountain Observatories.

BY EDWARD C. PICKERING.

Read March 14, 1883.

MUCH attention has recently been directed to the question whether the conditions are more favorable to astronomical observations on the summit of a lofty mountain than at the level of the sea. The evidence so far collected is somewhat contradictory, although there can be no doubt that for certain investigations great elevations are almost essential. It therefore appears to be of interest to consider what advantages are to be expected, what work should be undertaken, and what instruments are best adapted to securing results of value. Astronomical science is at present limited not so much by the imperfections of our instruments as by meteorological conditions. The first cause of error is the change due to the effect of variations of temperature in the instruments themselves. This is especially noticeable in large reflecting telescopes, where a slight irregularity of temperature — such as would be produced by placing the hand upon the mirror — would entirely destroy the sharpness of the image. In any precise measures care must be taken that all portions of the instrument are at the same temperature, or serious deviations will ensue. The second and more important source of error is that due to the atmosphere. Owing to variations of temperature, the density, and consequently the index of refraction of the air, is constantly changing. This effect is magnified by a telescope, so that we always perceive the fluctuations in the images of a

large telescope, such as are sometimes noticed by the unaided eye when looking through the column of heated air rising from a chimney. The effect of the absorption of the air is not very serious for objects near the zenith. At the level of the sea, about one quarter of the light of a star in the zenith is absorbed by the air. At the greatest elevations at which an observatory could be erected, only about one half of the air would be surmounted. The brightness of zenith stars will therefore only be increased a little more than a tenth of a stellar magnitude, — an amount which is scarcely perceptible by the most careful comparisons. In observing the sun, the intense light of the sky in its immediate vicinity often seriously interferes with the results. The observations of our fellow-member, Professor Langley, and of Professor Young, have conclusively shown the advantages, in such researches, of very elevated stations. The light surrounding a bright star or planet is largely due to the aberration, internal reflections, and imperfect transparency of the object-glass. It is not certain, therefore, that any great benefit would be gained by an increased altitude in observing the fainter satellites, or companions to bright stars. The principal advantage we should anticipate would therefore consist in the increased steadiness of the images. Should this result be realized, the importance of a mountain observatory would amply repay the inconvenience of conducting it. Not only would the accuracy of all measurements be increased, but close double stars would be more easily separated, and the structure of the surfaces of the planets would be more distinctly shown. Stars too faint to be seen under ordinary conditions would become visible, owing to the concentration of their light in a single point.

We do not yet know whether more hours of good “seeing” can be obtained at a great height than at a properly selected point near the level of the sea. There can be no doubt that great advantages would accrue from a proper location; but it almost always happens that political or personal reasons determine the place where a large telescope is to be erected, independently of the best climatic conditions.

The difficulties of maintaining a large observatory at a great elevation are very serious. Among them may be named the expense of transportation of all the supplies needed, the unwill-

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lingness of observers to lead so isolated a life, its probable unhealthiness, and the difficulty of performing much work of any kind in a rarefied atmosphere.

The expenditure required for an observatory may be divided into the original cost of buildings and instruments, and the current expenses for making the observations, reducing them, and publishing the results. If architectural effect is not aimed at, the building expenses need not be large. The impression is prevalent that the principal expenditure should be made on the instruments. In establishing many observatories this has proved to be a fatal mistake. If much work is to be done, by far the largest appropriation should be made for current expenses, mainly for the salaries of a large corps of assistants. At the Harvard College Observatory, the current expenses for two years would cover the entire cost of the instruments. In other words, estimating the rate of interest at five per-cent, ten times as much is expended on the observations, reductions, publications, and other current expenses, as on the instruments. A similar remark applies to the observatories at Greenwich and Washington. In most forms of routine work, such as is done at these observatories, the time required to prepare the observations for printing may be estimated at five to ten times that required to make them. The relative expenditures would not be so great, since much of the reduction consists in copying and in simple computations, which can be done by less expensive assistants. Apart from the high cost of living on the summit of a mountain, high salaries must be paid to assistants, to induce them to make the sacrifices required in such a life. Obviously, then, great economy may be attained by restricting the work on the mountain to that which can be done there only, and conducting the greater portion at some lower elevation, where the best facilities exist for completing it. Among other advantages will be the convenience for supervision and direction of the work, rapidity in publication, and ready communication with other observatories.

The principal question to be determined appears to be whether the increased steadiness of the air will give a real advantage. For this purpose two similar instruments, which need not be of very large size, should be erected, one on the mountain, the other at some convenient point below. Similar work should

be done with each for one or more years. The results would show the relative advantages of the two stations.

To proceed now to details. A form of telescope described in the Proceedings of the American Academy¹ has especial advantages for mountain observations. The telescope *A B*, Fig. 1, is mounted horizontally, pointing east or west, and has a plane mirror, *C*, inclined at an angle of 45° to its axis, placed in front of it. This mirror can turn around an axis coinciding

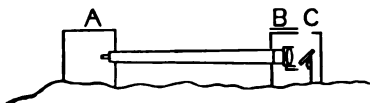


Fig. 1.

with the axis of the telescope, so that any object when crossing the meridian can be brought into the field of view. The position of the mirror can be controlled and determined by long rods extending to the eye end. Objects can be observed only when within an hour or two of the meridian, but in any large piece of work there are always enough objects so situated.

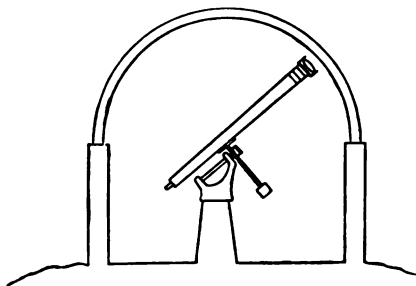


Fig. 2.

The usual method of erecting a telescope of the same size in a dome is shown for comparison in Fig. 2.

Among the advantages of the horizontal mounting may be named the following. A much smaller portion of the rock surface need be prepared for its

erection. Only a small shed, which should be a part of the dwelling-house of the observer, and a pier at *B C*, covered to protect the lens and mirror from the weather, are needed. The intermediate space below the tube may be left in its natural condition. A dome requires a prepared circular floor of a diameter somewhat greater than the length of the telescope. To derive the full benefit from a dome, the view should be unobstructed. The observatory must be on the summit of the mountain, where it is greatly exposed to storms, and where fuel and water are difficult to obtain. The horizontal telescope, on the other hand, only requires a clear southern horizon. It may, therefore, often be mounted where

¹ Vol. xvi. p. 64.

it will be protected from the most violent storms. The wind is a serious source of danger to a large dome. The figures show the relative surfaces exposed to it. Snow and ice are liable to render it impracticable to use a dome; while with a horizontal telescope this difficulty is reduced to a minimum, since it is only necessary that the shutter, over *C*, may be opened. A most important advantage of the horizontal telescope is the convenience to the observer. The consequence is that the hours of observation may be prolonged, and far more work accomplished. In a rarefied air, where every movement is fatiguing, the labor of moving a dome would be very great. With a horizontal telescope, as the eye-piece does not move, the observer sits in comfort, always looking horizontally. One of the greatest advantages is that the observer may work in a warmed room. The object-glass is so far distant, horizontally, that the heat at the eye-piece will not affect the definition. Work may thus be carried on with perfect comfort on the coldest nights. The application of this to observations during the prolonged nights in the arctic regions is obvious. Portability is often a serious consideration in work at great altitudes. No portion of the horizontal telescope need be so heavy but that it could be carried by a horse, or even by a man. The tube need only support its own weight, and may be made of tin. A heavy steel tube is required to give sufficient stiffness with an equatorial mounting. The horizontal telescope has especial advantages in steadiness, as mirror, object-lens, and eye-piece are all close to the supporting pier. This is an important consideration on windy nights.

Various researches suitable to a horizontal telescope have been suggested in the article named above. In general, the greatest proportionate saving will be effected, when the least skill and time are required in the observations as compared with their reduction. Photography offers an especially promising field in this respect. The improvements in dry plates render it not improbable that photographs will replace star-maps, for the brighter, and perhaps for the fainter, stars. A skilful photographer, even if he had but little knowledge of astronomy, might obtain in a short time a collection of photographs which, by a proper discussion in a more convenient station, would yield a vast collection of valuable results. It cannot be long

before a daily photograph of the solar protuberances, with occasional photographs of the solar corona, will form a part of the routine work to be expected from astronomers. The advantages of a great elevation in such work are undoubted.

The working hours of the assistants should be devoted almost entirely to observations. But little of the reductions should be attempted, as this can be much better done at the central office. A sufficient description of the work should of course be appended, to render the results intelligible to another person, but almost all the clerical work can be better done below.

Of course many meteorological observations could be taken with advantage in a mountain observatory, and by self-registering instruments the time of the observer could be saved. The maximum force of the wind in storms, and the minimum temperature in winter, should be especially noted. An important investigation would be the measurement of the variations in the atmospheric refraction by the micrometer level (APPALACHIA, I. 63, 138). The apparent altitude of a number of the most distant points should be observed from time to time, and the atmospheric refraction deduced. Observations of the thermometer and barometer should be obtained at the same time. The value of the work would be greatly increased by simultaneous observations at one or more of the points observed. Such observations might at least be obtained at some point in the country below. Barometric observations at such a point, where the difference in height was as great as possible and the horizontal distance small, would have great value in determining the relation of the barometer to the height, as affected by other meteorological conditions.

In selecting a proper location, many preliminary observations would be necessary. We cannot depend altogether on the meteorological observations already made, as they commonly give the rainfall rather than the amount of cloudy weather. If a point could be found where the sky was almost always clear, at least in certain seasons, a great additional advantage would be gained for many purposes. Much time is now spent in preparing to observe certain occasional phenomena, and no result obtained on account of clouds. With a certainty of clear weather, one observatory could often make all the observations needed of such phenomena.

The portability of the horizontal telescope is a strong argument in favor of its use in the preliminary observations. The first trial might be made with a telescope of the usual form, small enough to be carried by a horse. As high a magnifying power as it would bear should be employed, and images of bright stars, of close doubles, and of faint companions to bright stars should be studied as they approach the western horizon. By noting the time at which the images become unsatisfactory, we can compute the altitudes at which they are equally good on different nights. We have thus a quantitative test of the steadiness of the atmosphere in different places. The amount of air looked through is proportional to the secant of the zenith distance. Suppose that at a given location we could see a star to within 30° of the horizon, as well as we could see one in the zenith at the sea-level. Since the zenith distances in the two cases are 60° and 0° , and the secants 2 and 1, we should infer that the relative steadiness of the air at these places was as two to one. Repeating the observation with a number of stars, we should soon establish a habit of observing which would give a much better determination of the condition of the air than any ordinary estimate. The transparency of the air may also be well determined by the eye alone. It is only necessary to compare a bright star, while rising or setting, with others near the zenith apparently equal to it in brightness, and note the time of such comparison. A watch and star-map are all that are needed for these observations. The difference in the absorptions will then equal the true difference in brightness of the stars. The reduction may be made subsequently by computing the altitude of each star, and deducing the law of absorption by combining all the observations made at nearly the same altitude. These observations are so easily made that they are recommended to any traveller in a region where the atmosphere appears to be particularly clear.

So much time will inevitably be occupied by the preliminary observations, that some years must elapse before we can expect to find a mountain observatory in full operation. An important step would be taken by the Club if it could lessen this interval by aiding in the preliminary work. No mountain in this vicinity is sufficiently high to be used for such an observatory as is here contemplated. This objection would not, how-

ever, apply to the preliminary observations. Mt. Washington would not be suitable on account of the prevalence of clouds and the severity of the winds and storms. The same criticism may be made to the selection of Mt. Lafayette, Mt. Adams, or Mt. Jefferson. Their pointed summits, and the difficulty and expense of occupying these stations, also render them undesirable. Mt. Moosilauk on the other hand, although less elevated, has a large flat summit, well adapted to work of this kind. It is moreover within convenient reach of the railroad, and has a carriage road to the top, over which the instruments could easily be transported. The house on the summit would afford abundant accommodation for observers, and has already been occupied during the winter by a member of this Club. Probably no point could be found, having an equal elevation, where the preliminary observations could be conducted at less expense. Several boarding-houses at the base of the mountain would furnish additional accommodation, if needed, and greater comfort in case of accident or illness. Should any unforeseen difficulty present itself, nearly equal advantages would be possessed by Mt. Mansfield, the highest of the Green Mountains. A series of observations at one of these points would clearly show the difficulties to be anticipated at a more elevated station. For the latter it is doubtful if we could find a better point than Mt. Whitney, the station selected by Professor Langley. The geographical location and meteorological conditions of this mountain are particularly favorable. It is one of the highest summits in the United States, and is so situated as to be unusually free from haze, clouds, and storms. Although at present somewhat difficult of access, it is probable that a railroad will soon be constructed to within a short distance of its base.

In conclusion, it is still uncertain whether any important advantage would be gained in most astronomical work by a great elevation, as compared with the best possible location at a moderate height. The question should, however, be decided, and it is believed that by the plan here proposed a sufficient test could be obtained at small expense. In any case valuable results would be attained, even if the observations in the observatories on the mountain summit were not much better than those at a less altitude.

The Twin Mountain Range.

By A. E. SCOTT.

Read March 14, 1883.

THE Twin Mountain Range has long been regarded by Appalachians as an interesting field for exploration. Many times we have looked longingly from higher summits, especially from Lafayette, upon its bare ledges and wooded ridges, and resolved at an early day to make their more intimate acquaintance; but the summits are so distant from the clearings, and the reports of those who had attempted to reach them and failed were so discouraging, that it was difficult to find any one who cared to join the undertaking. In August last I determined to make the attempt, accompanied by a single woodsman, who might be of service in an emergency and who would assist in carrying the packs.

The Range stretches from the valley of the Ammonoosuc on the north, to the valley of the East Branch of the Pemigewasset on the south, and consists of a long, broad ridge, with a number of elevations from one to four hundred feet above the general level, four of which have received the names respectively of North and South Twin, Guyot, and Bond. It is surrounded on all sides by vast wooded tracts, lumbered only a short distance at the northerly end, and otherwise very little explored. It was my plan to enter the forest on the north, force my way to the summit of the North Peak; thence, crossing the whole ridge and descending into the East Branch region, to make my exit from the forest as circumstances required.

While making the arrangements I was surprised to receive a letter from a gentleman somewhat prominent at Bethlehem, where the plan had become known through the woodsman whom I had engaged, which ran as follows:—

“If any ladies are to join you in making the Twin Mountain exploration, Miss X., who has had much experience among the mountains, asks the privilege of being one of the party.”

I replied at once that I had failed to find any man who wished to undertake it, and it had not occurred to me as among the possibilities that any woman would desire to do so. "But," I added, half in jest, "whenever I hear of a woman who desires to explore wild places, and to see the old forests as they exist far away from ordinary routes of travel, I am filled with an equal desire to assist her in doing so. If Miss X. is capable of enduring long-continued and fatiguing work : can endure thirst perhaps for hours ; can sleep without blankets, or possibly without shelter of any sort ; can force her way through scrub of the most fearful kind, where the clothes may be torn to shreds ; can endure extremes of heat and perhaps of cold ; can go all day in a storm, drenched to the skin, — if she can endure these things, and — after my assurance that these and even greater hardships are probable on the proposed trip — still wishes to make the attempt, I will invite the only lady I know for whom the undertaking is feasible, to accompany her."

By the returning mail I was informed that, notwithstanding all my discouragements, Miss X. was exceedingly anxious to go on the exploration. While reading this last letter in the presence of another lady-member of the Club, she at once enthusiastically asked to join the party. I was fairly caught. I had painted the probable difficulties of the proposed exploration in glowing colors, and had rather disdainfully expressed a willingness to invite ladies to accompany me if they dared attempt it ; and here were three ladies who not only dared, but were eager to go. I would not retract, although I had many misgivings, and some doubts of their reaching even the first summit.

Another packman is engaged, and an early day appointed for starting. At the time appointed we meet on the highway, about two miles north of the Twin Mountain House ; the provisions and the few necessary articles we are to carry are securely packed, and the journey is begun.

We cross the Ammonoosuc by the railroad bridge, traverse the cleared field beyond, and soon enter the forest. As we wind along the old logging-road in single file, the two packmen take the lead : one an old man of sixty, who claims to

know something about the region,—the other a young man, whose chief recommendations are his pleasant face and broad shoulders. They present a picturesque appearance in their new, embroidered shirts, with their heads protruding through their meal-bag packs. The ladies follow: one an M. D., who is happy in escaping for a few days a wearisome city practice; one a student of medicine, only too ready to leave pills and powders for a mountain climb,—both these members of the Appalachian Mountain Club; the third, a special correspondent, somewhat nervous in this her first forest experience. I bring up the rear with a huge pack, carried easily on an Appalachian frame.

The road runs parallel with and some distance from Little River for two miles. We pass an extensive logging-camp, known as Tarbell's; another, a short distance beyond, called Day's, and soon after turn abruptly from the road down to the noisy stream. The day is warm; there is no fixed point which we must reach before night. The old man is happy with his fishpole, wading in the middle of the stream, and lingering by the frequent cascades and in the cool shades; we press slowly on, sometimes jumping from boulder to boulder, and sometimes finding an easy way in the forest along the river's banks. By the middle of the afternoon we have passed around the great foot-hill, which lies northerly from the north summit, and is sometimes pointed out as one of the Twins, and reach the stream which flows from the intervening ravine. This stream flows into Little River at the foot of quite remarkable falls, deserving of a name and more than this passing notice. From this point the valley grows narrow,—the long ridge, which stretches easterly from the North Summit, rising rapidly from the stream on one side, and the Little River Range even more rapidly on the other. We leave the stream and bear southwesterly up this shoulder, until the declining sun warns us to select a camping ground. We have been climbing diagonally, so that we are close to the ravine on the southerly side of the ridge. Descending a short distance, we come upon a cold stream, find a favorable spot, and build our camp.

We have plenty of time to build a somewhat elaborate

one in the usual fashion. Two crotched sticks are placed the required distance apart for uprights ; a pole is stretched across, and others placed on this for rafters, which extend back to the ground ; the roof is covered with bark ; the sides are protected with branches of fir and spruce ; the front open, and the floor covered with boughs. A mountain-ash is cut for a backlog, and smaller logs of maple and birch for fuel. A fire is kindled, the old man displays the treasures of his basket, and soon a score or two of speckled trout are sputtering over the coals. We have merely lunched on the way, and are in good condition to enjoy our sumptuous repast of oatmeal, hard bread, and trout. There is no array of fine linen or china, or attendants to serve us ; but we have a log for a table, — covered with a network of lichens and mosses more delicate than the tracery on the finest damask, — birch-bark for plates and napkins, fingers or pointed sticks for forks, and a frying-pan common to all. We talk over the events of the day. The ladies are elated at the success of the first day's tramp, and have no fears for the morrow. The repast over, we stretch back upon the fragrant boughs. For a while we are merry with jest and song and story, and the forest resounds with shouts of laughter ; but anon the silence is only broken by the nasal utterances of the old man, — who sleeps outside with his back against a stump, — the crackling of the flames, and the brawling of the stream beyond. It is a novel experience to some of the party ; and, in the morning, the reddened eyes and stiffened limbs indicate that they have had the usual experience of a first night in camp.

Breakfast over, the journalist and the packmen are eager to be off, and as we are merely to climb the shoulder on the slope of which we have camped, — so that there is little danger of becoming separated, — they start off ahead, agreeing to wait for us on the summit. We caution them against drinking freely in the early part of the day, for we anticipate a waterless summit. An hour later we follow, bearing north-westerly until we are out of the ravine, and then westerly to the summit. It is a fine forest and we enjoy the climb, although the ascent is rapid. The day is warm, and we soon pass beyond the limits of water. At about eleven o'clock the

forest proper seems to end very abruptly, and a quite different growth begins. We have reached the line of scrub spruces, and are soon floundering helplessly. We are familiar with scrub as it appears on Adams, Carrigain, and other summits, but the worst places on those summits seem to us like pleasure-grounds compared to this. Twin Mountain scrub is unique; it is indescribable. We walk upon the tree-tops, only to disappear at last; we crawl prone beneath the lowest branches; we cut our way through with the hatchet; we try first one way, then another, and always feel that some other way must be better. We imagine our friends waiting for us on the summit, and despair of reaching them; when, as we climb upon an out-cropping rock and get a view of the immense sea of scrub stretching in all directions, we descry in the distance their heads just above the level. To feel that we are not alone in our misery revives our courage, and we press on inch by inch, until about one o'clock we reach the bare ledges that crop out on the northwesterly side of the summit. Our companions soon arrive, and we throw ourselves upon the ground, — heedless for awhile of the magnificent view stretched out before us. We are all suffering from thirst, but the packmen have not heeded the advice of the morning and are in a deplorable condition. There is almost a mutiny for the possession of the pint canteen of water which one of the ladies has brought safely through; but we dole out a half-gill only to each person, reserving the remainder for a greater emergency which we fear may arise.

We are suddenly aroused by brilliant flashes which come to us from Bethlehem, and we eagerly respond with a bit of glass brought for the purpose. Some friends knew that we hoped to reach this summit at about this time, and they are inquiring for us. We have not the code sufficiently at command to exchange messages; but it is interesting to communicate even in this mute way with friends so far below us and so widely separated, and it arouses a chain of pleasant thought.

The summit of the North Twin is rounded, the slope being gradual for a considerable distance toward the east and south and rapid on the north and west. It is covered with scrub,

with the exception of a small space on the northwesterly side. We get extended views from this point toward the west and north, and, from ledges which rise above the scrub a short distance from the real summit, toward the east and south. The summit of the South Twin, apparently higher than the North, is hardly a mile distant, and the col between is very slight.

A shower threatens, and we hope for a heavy rain that we may quench our thirst; but only sufficient water falls to wet the scrub, and we are drenched to the skin by contact with the wet branches. This growth is not so thick on the southerly side, and we do not have great difficulty in the descent; but we find no water, and dare not attempt the climb of the South Peak without it.

From the col the descent is rapid into the great ravine between the immense shoulders which extend easterly from both summits. We bear down into this ravine, and soon come upon the track of a slide two or three rods wide, and extending far as we can see down the mountain-side. The centre of the slide is evidently the bed of a stream now dry. We follow it down, and at last find water trickling drop by drop through a crevice in the rocks.

It is too late in the afternoon to begin another ascent, and we conclude to go into camp. We search in vain for a level spot, and are forced to build our camp among the rocks, filling up the spaces between as well as we can with moss. We are at such an altitude that it is difficult to get sufficient bark to cover our shelter; but fuel is abundant, and we care more for warmth than for a covering. We do not dine as sumptuously as we did last night, but are quite content with hard bread and hot oatmeal. We are in a wretched plight, wet and torn, but all jolly,—the journalist only showing slight symptoms of discouragement. We spend some time in repairing the ravages of the scrub; but there are few jokes and stories, and the camp is still at an early hour.

We have a refreshing sleep, fitted in among the rocks, and are off at an early hour in the morning, determined to advance farther on our way than yesterday. We are in the same ravine in which we camped the preceding night, only

higher up on the head wall. As on the previous day, the journalist starts off in advance with the packmen. The men carry, for our mutual benefit, a half-gallon of tea.

The climb is exceedingly steep and treacherous, and we strike the scrub nearly a half-mile from the summit; but we patiently work through it and reach the summit in the middle of the forenoon. We have not seen our companions, have been without water, and expect to find them with their can of tea on the summit; but they are nowhere to be seen, and do not make their appearance until nearly two hours later. They are nearly exhausted; the men have disposed of the last drop of tea, and again make demands on the small canteen which the ladies are carrying for an emergency.

We find about an acre of bare ledges, so that the view is unobstructed in all directions. It is grand beyond description. We are especially interested in the range we are exploring and the mountains which are near to us. From this south peak the two summits seem to be of about equal height. From other elevations it is impossible to form any conception of the great ridges that extend east and west from the various summits of this range, and the immense ravines between them. Two of these ravines open into the valley of the Little River.

On the easterly side of this valley rise abruptly the Little River Mountains and we have ample opportunity to study this range, about which little seems to be known. It extends from Mt. Hale, on the north, nearly to the East Branch region on the south. At the head of the Little River Valley it seems to be separated by a slight depression from the ridge which extends northeasterly from the summit now called Guyot.

Beyond the Little River Mountains we trace distinctly the valley of the New Zealand River, and two or three ranges of hills between the New Zealand Notch and the northerly part of the Field-Willey Range. On the west we have an equally good opportunity to study Garfield, the unnamed ridge south of it, the eastern slopes of the Franconia Range, and the great valleys between. The ridge south of Garfield lies between the two branches of the Franconia River. At its

southerly end are large cliffs, which the old man calls Owl's Head. A long ridge, with three distinct summits, curves around southwesterly, ending abruptly opposite these cliffs. Between these two slopes flows Red Rock Brook.

Directly south of us, a mile distant, with two or three intervening elevations, rises a pointed summit, wooded to the top, and nearly as high as the Twins. Southwesterly from this summit, closely connected with it and only slightly lower, are two broad, bare, and picturesque plateaus, with a slight depression between them. We are of the opinion that this summit, with these plateaus, should be known as Guyot. Still farther south, separated from the farthest plateau by a narrow col, a hundred feet below the latter, rises sharply another summit, somewhat higher than the last, wooded to the top; and stretching southwesterly, also, from this is a long narrow ridge, at the end of which rise the enormous cliffs which have been called Bond. The last summit has been called by some, Guyot. There seems to be no good reason why the cliffs, which are so evidently a part of and so near to this summit, should receive a separate name, especially when there are so many prominent peaks in the range without names; and we suggest that the whole of this part of the mountain mass should be known as Bond, — Guyot being applied to the portion north of it, as previously suggested.

We remain on the South Twin for two hours, enjoying the view and carefully jotting in our note-books the new points we discover, but thirst compels an advance. We resolve to reach the col beyond the ledgy plateaus by night, and conclude to leave the intervening scrubby hills on our right, bearing low enough into the ravine on the left to find water. In the middle of the afternoon, soon after we have got through the scrub, and not far from the centre of the col south of the summit, we discover a beautiful spring — the only water we find on the whole range within a reasonable distance of the ridge. The season was very dry, and we believe this spring will never fail. The packmen and our journalist bear evident signs of demoralization, — the new, embroidered shirts have long ceased to be attractive, and the flannel dress of the latter is torn to shreds; but the other ladies are fresh, and three

of us decide to press on that we may have a longer time to remain on the summits beyond, leaving the others to follow when rested. They promise to follow our trail, which is very distinct, and to reach us before night.

As we bear up toward the summit, we find the scrub worse than any we have yet seen, and many times we are almost conquered; but we reach the summit, and press down to the plateau below. We are thrilled with delight. We are surrounded on all sides by mountain peaks which shut out all signs of civilization, save the buildings on Washington. The sun is setting behind Lafayette, the shadows are filling the deep ravines, and a profound stillness prevails. Darkness is rapidly approaching, and our friends have not appeared. It is useless to try to find them; so we gather a pile of dry wood, kindle a bright fire, and make ourselves comfortable on the dry moss. At last the old man emerges from the scrub, alone. He reports that the others entirely gave out soon after we left; that they have gone down into the ravine for water, and have sent him to overtake us and bring us back. It is quite dark, but we start at once. We cannot retrace our steps through the spruces, but we hurry across the ledges and descend by the rocks — which fortunately extend below the scrub — to the col beyond, and along the top of the head wall of the great ravine, down the side of which they have gone. It is very steep, and so dark that we have to feel our way with the greatest care. We are following down the bed of a stream, and distinctly hear the water gurgling under our feet, but it is so far beneath the rocks, that we cannot reach it. We continually shout to our companions, but get no response. We give up all hope of finding them for the night, but continue to descend and grope about, on hands and knees, between the rocks in our search for water. We hear it rippling tantalizingly beneath, — sometimes, apparently, near to us, — but always beyond our reach, until, at last, after an hour's search, it gushes out, cool and clear, beneath a huge bowlder that blocks the way.

We have not lunched since breakfast. On inquiry we find that all the provisions have been left with the rest of the party; and we have nothing to eat, save two small sticks of prepared

chocolate. We have our kettle with us. We boil two quarts of water and stir in the chocolate; there is enough for all, and we are quite satisfied with our evening repast. The old man attempts to cut wood for the fire, but falls asleep with his axe in hand, and we cannot arouse him. We grope about and gather a considerable pile of dead wood for the night's supply, and then fit ourselves in among the rocks for pleasant dreams. I certainly have them, and do not wake till morning, when I find, to my chagrin, that the Doctor has spent much of the night in tending the fire; but she declares it was a delightful experience, and both ladies are merry and enthusiastic.

We have nothing to eat, and while we are sitting around the remnants of our fire, in doubt as to what shall be done, we hear a faint shout from far down the ravine. The old man answers. They find our direction, and in half an hour our lost companions are with us. They have had a good fire, plenty to eat, and a good night's sleep. We hastily breakfast, and climb back to the col from which we descended the night before.

The last peak in the range, which we have suggested should be called Bond, rises rapidly from this col. We determine to keep below the scrub-line, by flanking this summit to the right; but we soon find ourselves in difficulty, and think the better way is to aim directly for the top. The side is very steep, in some places precipitous. We are forced at last to bear up the mountain, and come out, about noon, not far from the summit, near a huge boulder which is a noticeable feature from distant points. From this point the great cliffs are a mile away. It is not difficult to reach the col by following the rocks which appear above the scrub on the southerly slope, or to ascend the cliffs beyond.

These cliffs are several acres in extent, bare of vegetation, and stretch out southwesterly, extending nearer to the Franconia River than to the East Branch. On the northwesterly side they jut into the gulf, and rise almost vertically from the valley below, like the ruins of some enormous castle. A long ridge extends westerly from the summit, ending in a high, wooded bluff, which also falls off abruptly toward the Fran-

conia River, and on the side towards the cliffs. The great gulf, between the cliffs and this wooded bluff, seems more stupendous than those in the sides of Washington. A narrow gateway leads through the cliffs down the head-wall of this ravine, similar to that leading into King's Ravine.

It seemed to us that it would be easy to reach these cliffs by following up the Franconia Branch to the stream which flows in on the right, about one mile from its junction with the East Branch,— then following this stream through the ravine and ascending the wall through this gateway. Another long, wooded ridge slopes southerly from the boulder to which I have referred, clear to the East Branch. Between this and the cliffs, on the easterly side, there is another immense gorge.

We had felt that the views from the South Twin and from the plateaus of Guyot were grand and beautiful, but the view from this crag surpasses everything we have ever beheld. Never before have we realized the extent of the Pemigewasset Forest, or the grandeur of the mountains which rise in and around it. We have found no water since leaving camp; as usual, the men have on the way disposed of all the tea they started with, and we are suffering intensely from thirst. Our lips crack and the skin peels from the roofs of our mouths. The old man declares he never will attempt another trip like this, the young man would give a thousand dollars (which he does not possess) to be at home, and the journalist begins to discuss the easiest way of emerging from the valley below; but the rest are unmindful of their discomforts, and — although it is the day when the mercury rises the highest in the lowlands, and we cannot escape the merciless rays of the sun which are pouring vertically upon us — we linger an hour entranced by the wonderful beauty of the scene.

The belt of scrub surrounding this crag is narrow, but we get through it only after a severe battle. We descend rapidly the steep wall of the ravine, on the southeasterly side of the cliff, and in a couple of hours strike the head-waters of Bear Brook. We are so exhausted that we are ready to go into camp at an early hour. The timber is large, the bark peels readily, and we construct a luxurious camp close to the noisy stream.

The next morning we start early and follow down this stream through a constantly widening valley, heavily wooded, with enormous pines scattered here and there, until, at last, we reach the longed-for river. The old man is at once in the middle of the stream with fishpole in hand, and in half an hour a pan of delicious trout is set before us. We are so delighted to reach an abundance of water that we delay here for three hours in the cool shades among the rocks. The old man goes ahead up the river, and when we finally reach him, near the Forks, he has strings of upwards of two hundred trout. The Forks are supposed to be twelve miles from the mouth of the river. The views of Hancock and Carrigain at this point are very wild and beautiful. The southerly branch of the river, rising in Howe's Pond near the Saco Valley, is fed by streams which flow from the Nancy-Carrigain Range; while the northerly branch, rising in Willey Pond and in the swamps on the side of Mt. Field, is fed by larger streams flowing from New Zealand Notch, and from the deep gorges which extend up into the southerly end of the Little River and Twin Mountains. Between these two branches there is a long line of wooded hills, one of which, lying close to Thoreau Falls, is of considerable height.

We follow the northerly branch, hoping to reach a camp built last year, on another exploration made by some of the party; but the distance is greater than we suppose, and darkness overtakes us before the camp is reached. We find a charming spot in a cluster of pines close to the edge of the river, where we build our camp-fire. The frying-pan is filled and refilled many times with trout, for we have broken our three days' fasting on oatmeal and stale bread, and it seems as though we can never get enough. We have no shelter, and soon after dark the clouds gather and the rain begins to fall, threatening an uncomfortable night; but later on the moon shines forth, the camp-fire blazes brightly, and we are dry and happy.

A change has come over the old man; he has forgotten the discomforts of the mountains, and—so long as fish abound—he cares not for home. He regales us with stories of the woods, in which he is the principal actor, and our camp is not silent until a late hour.

Our journalist is still anxious to reach home. It seems possible for her either to follow down the stream and reach North Woodstock by way of Pollard's; or, continuing up the stream, to follow the branch which flows from Willey Pond, thence by the trail and the Appalachian path to the Willey House. She decides upon the latter course, and it is arranged that she and the young man shall start as soon as it is light, hoping to reach the Willey House before night. Soon after their departure the old man starts up the stream with rod in hand, agreeing to wait dinner for us on the rocks above Thoreau Falls. The morning is beautiful, and we do not hasten from our charming nook among the pines. We sometimes clamber along the banks in the old forest; at others wade in the middle of the stream, taking little heed of time. We reach Thoreau Falls, and spend an hour in climbing about the rocks. It is a wild spot. The river tumbles over the ledges between high bluffs in many picturesque leaps. A short distance below the foot of the falls, the stream which flows from New Zealand Pond comes in from the north. A half-mile up this stream the valley is very narrow, the mountains on either side rising rapidly. This is the only place in this valley, or in the valley of the New Zealand River, which can properly be called a notch.

It is four o'clock when we reach the top of the falls. We find upon the rocks the frying-pan full of trout, and the old man fast asleep on the bank above. He informs us that two hours before, the young man appeared in breathless haste, stating that the journalist had entirely given out and was anxiously waiting two miles beyond for the doctors to come up. We hasten on, but do not find matters in the serious condition we feared. She had despaired of getting out, and had thought it wise to wait where we should reach her before night. During the afternoon the clouds have been gathering and the wind rising, and the rain is now falling. We work rapidly and build a camp, but are drenched before it is completed; and the rain drives with such fury that it affords us slight protection; yet we get considerable comfort from our smouldering camp-fire, and cannot help enjoying the wildness of the night.

The stream, in which we were wading a few hours before, becomes a maddened torrent carrying everything before it. The great trees sway and creak; the thunder rolls heavily, and the lightning crashes in the forest all around us; but about midnight the stars suddenly appear. We renew our camp-fire, and before morning we are dry and comfortable. Again the journalist arranges an early start, — and this time with both men, that she may be sure of success. She has shown a wonderful perseverance under very adverse circumstances, but is much pleased with the prospect of returning home. They are to go out by Willey Pond, and we propose to explore the main stream to its source on Mt. Field. They meet with no difficulty, and are out by the middle of the afternoon.

We follow slowly, reluctant to leave the old forest and the wild stream. The forest is full of well-trodden paths of deer, and we frequently see their delicate footprints and occasionally fresh tracks of a bear, but we get few glimpses of animal life.

From the mouth of the river, nearly to Thoreau's Falls, the ascent is very gradual, presenting few obstacles to a roadway. This gradual rise continues up the stream, which flows in below the falls, to the height of the land at New Zealand Pond. The New Zealand River rises near the pond, and the descent through its valley to the Ammonoosuc is also gradual. The lumber in the whole region is valuable, and we may expect, at an early day, to be able to go through this forest — from the Ammonoosuc to the upper waters of the Pemigewasset — by regular conveyance.

For a mile or two above the falls the rise is gradual; but above Willey Pond Brook the ledges constantly crop out, and the stream becomes very rapid. A mile above the brook we reach the wild gorge referred to in an account of an exploration made last year. The water dashes down high cliffs in a succession of cascades, forming a picture of wonderful beauty. At the foot of the cascades, in the middle of the stream, rises a high rock, making a natural seat for the study of the picture. A short distance above these cascades we reach a swampy plateau sparsely covered with trees, in which

the stream divides and is soon lost among the rocks and debris on the steep mountain-side.

We build a fire by a cool spring, dine on our last cup of oatmeal and our last stick of chocolate, hang our skillet high up on a tree for use another year, and begin the climb. We are directly under the steep western slopes of Mt. Field. Above us we see the immense ledges glistening in the sunlight.

The swampy plateau seems to extend a considerable distance to the north; and beyond the precipices there is a depression in the ridge, over which it seems to us there may be an easy exit to the Crawford House. But we are not sure of our bearings in that direction. Our supplies are entirely exhausted, and we cannot risk another night in the forest; so we bear southeasterly, to avoid the ledges and to strike the ridge between Mts. Field and Willey.

The climb is difficult; there is no soil,—nothing but immense fragments of rocks, covered with moss which treacherously conceals the pitfalls; and we are an hour and a half in reaching the ridge. We follow the ridge to the summit with little difficulty. The view is fine, especially down the Notch, and by clearing a small space we think it would equal that from Mt. Willey, in all directions. It is more direct to descend by way of Mt. Avalon, or the ravines on either side of it; but our time is limited, and we conclude to descend by way of Mt. Willard and the carriage road. It is very steep and ledgy, but we are expert after our seven day's climbing. We let ourselves down rapidly by the small birches and poplars in the rock crevices, cross the col, and climb the ledges of Willard. We are in a sorry plight to meet the hundred visitors who happen to be on the summit for a sunset view; but just as we are congratulating ourselves that we have escaped notice, we are recognized, and would soon have been the centre of a curious crowd, had we not excused ourselves with hasty explanation. Before starting we had taken the precaution to send some luggage to the Crawford House. In a half-hour there is a marked change in our garb, and we are on our way to Boston.

The Blue Hills.

BY E. G. CHAMBERLAIN.

THE Blue Hills may be considered as the nearest mountain range to Boston. Their summits do not appear very high, to be sure, in tables of altitudes ; but as the surrounding country, so near the seacoast, is very low, — the Providence Railroad near Green Lodge having an elevation of only about fifty feet, — their height counts for its full value.

The entire range is seven miles long. Beginning at Little Blue in Canton, it extends easterly and then northeasterly, and terminates at President's Hill, opposite the Old Colony station in Quincy. The highest summit, and at the same time the highest elevation of land in Eastern Massachusetts, is Blue Hill, or "Blue Hill Mountain," as it is called by those living near it. It is situated in the township of Milton near the Canton line, and rises 635 feet above the sea. It was an important station of the State Survey, and afterwards of the U. S. Coast Survey. A mile easterly from Blue is Hancock Hill, 507 feet ; a mile further east, Bear Hill, in Quincy, 495 feet ; a mile northeast of Bear is Fenno's Peak, 518 feet, the second in height of the range. Seven other summits reach 400 feet or upwards. Diligent inquiry for their names has resulted in but slight success.

So wild is this region that a section nearly five miles long, extending from East Milton through Quincy into Braintree and Randolph, is crossed only by the cart-paths leading to the quarries and wood-lots. Between Hancock Hill and its western ridge is an elevated basin, open to the north, called the Hancock Valley. On the eastern slope of Fenno's Peak is a wild narrow pass, resembling a railroad cut, which I have called Fenno's Notch. In answer to a question often asked me, let me say that I have never seen a rattlesnake among these hills.

The quarries of Quincy granite are near West Quincy, where the hills are almost honeycombed with quarry-holes. Here

is Railway Hill, where may be seen remains of what is claimed to be the first railroad in America, built about 1826 to convey the stone to tide-water. This hill is now a mere shell, from the edge of which we look into a deep abyss. The summit long ago disappeared, and far below the spot where once stood a stone observatory, we see the quarrymen still excavating.

While studying the view from Mt. Prospect in Waltham, I had found it generally impossible to identify these hills with those shown on the maps ; so in 1876 I explored and mapped them out (See Plate IV.), using at that time a pocket-compass and a small pocket-level. During the past year I have revisited the principal summits and fixed their positions by the three-point method, by observing the steeples in the surrounding towns, which were located in 1838 by the Massachusetts Trigonometrical Survey conducted by Simeon Borden. My apparatus was very simple and portable, constructed by myself fifteen years ago for a similar work on the Waltham and Weston hills, but the value and probable error of each observation were known. The three-point stations should be correctly located within fifty feet horizontally and seven feet in altitude. The compass stations are less accurately determined. The highest point of each hill was chosen as a station, and usually marked by a two-inch triangle ; but on account of the bushes it was often necessary to observe the three points in pairs at eccentric stations, and reduce to the centre. The same obstruction usually prevented observations between the stations. A square yard of black or white cloth, tied to the bushes, answered for a signal when necessary. To obtain the altitudes I connected by triangulation the summit of Fairmount Hill with the Providence Railroad, making Fairmount 258 feet above the sea. The State Survey made Blue Hill 635 feet. When possible I observed to each summit from Fairmount, and from each summit to that of the principal peak, taking the mean of the two results as the true height. The original map was drawn to a scale of 1,650 feet to the inch, about 1 : 20,000. Twenty-five summits were visited, and twenty miles of cart-paths "meandered" and paced, with pocket-compass in hand. For such details as streets, boundaries, and the like, the town maps in the county atlas were copied to a uniform scale, and

fitted together, the churches observed upon by the State Survey being placed in their proper latitudes and longitudes; the streets and boundary lines were then averaged, where they did not coincide.

Situated so near Boston, the chief summit of the range is frequently visited. It is only $1\frac{3}{4}$ miles from the railroad stations at Readville to the Junction of Blue Hill and Canton Avenues in Milton, 220 feet above sea-level, and from this point a path, seven eighths of a mile long, leads to the summit. For extent and variety combined, the view is unequalled in this State, except by that from Wachusett, embracing as it does city and country, sea and mountain, pond and river, and all in large measure. As it requires many visits to enable one to identify the details of so complex a landscape, I shall perhaps do a favor to future visitors by putting on record in *APPALACHIA* a somewhat minute description of this prospect.

All elevations given are reckoned from sea-level, and all bearings from the true meridian. Those using a compass must remember that the needle points N. by W., or about eleven degrees west of true north, and allow accordingly.

Let us take the view in order, turning from left to right. A line due north almost touches the tower of the Harvard College Memorial Hall in Cambridge, eleven miles distant; nearly hidden by which we see, three miles beyond, the Unitarian church in Medford. Directly under the tower is Jamaica Plain. A trifle to the right is Holt's Hill in Andover, a bare smooth eminence about thirty miles off. Considerably to the right is another bare, lenticular¹ hill, Bald Pate in Georgetown, about thirty-five miles distant, seen directly over the Malden Orthodox church. A little to the left of this, eight miles away, is seen the white tower of the Roxbury stand-pipe. Midway between Holt and Bald Pate appears Somerville, twelve miles off, presenting a red church and brick high-school, side by side upon a hill. To the right of the stand-pipe is spread out the city of Boston. The State House is ten and one half miles distant; its bearing, N. $14^{\circ} 22'$ E. A little to the right of the State House one sees the State Insane Asylum in Danvers,

¹ I use this word, employed by Professor C. H. Hitchcock and Mr. Warren Upham, to denote the rounded shape of our drift-hills.

twenty-seven miles distant, a long building on a hill. To the right of the city is Boston Harbor, stretching far round toward the east, with its islands, forts, and lighthouses. North-northeast is the Reservoir Hill in South Boston. Looking up and turning to the right we see successively Lynn, Salem, and Swampscott, and, under the latter, Winthrop. Nearer, and a little right of Winthrop, lies Fort Independence, nearly under whose right are the two steeples of Milton Centre, three miles away. A little to the right is a church in Nahant, eighteen miles off, seen directly over a steeple about six miles distant, near Neponset; and nearly over the left of the Nahant church one in Marblehead. To the right, along the horizon, we follow the North Shore as far as Eastern Point lighthouse in Gloucester, distant thirty-four miles.

Northeast, eleven miles, is Long Island, with its low lighthouse. Far beyond and to the left, between it and Eastern Point, are seen against the sky the twin lighthouses of Cape Ann, apparently standing in the ocean. Their distance is forty miles. We are now looking down Massachusetts Bay, several hundred square miles of which are visible. The sea horizon crosses this at a distance of thirty-three and three-eighths miles. Sails may be seen far beyond this, the hulls being hidden by the earth's convexity. Turning far to the right we see, N. $55^{\circ} 05' E.$, Boston lighthouse, directly over the church-spire on Wollaston Heights. Six miles east-northeast is Quincy village. Over it we discern Strawberry Hill, thirteen miles off, with Nantasket stretching a long distance from it both right and left, thus making it appear like a bead strung on a thread. Following Nantasket to the extreme left, we find Hull village. On the right, Nantasket ends at the triple-turreted Atlantic House, which we see over the left slope of Fenno's Peak, the second in height of the Blue Hills, and three miles off. Over its right slope is Minot's Ledge lighthouse, eighteen miles distant. Over the right base of Fenno lies Hingham, with three steeples in a cluster.

Just to the right of east, one observes a large brick building some six miles distant, with a large village stretching away to its right; the building is Thayer Academy, and the village,

South Braintree. Nearly over the academy are the two spires of Scituate, eighteen miles distant.

To the southeast the country appears quite level and well dotted with villages and ponds. Of the ponds, the more noticeable are Wissahissick (or Houghton's), Ponkapog, Canton Reservoir, and Massapoag. I have named them as they appear from left to right, and also in the order of distance, Wissahissick being one mile east-southeast, and Massapoag eight miles south-southwest. Immediately to the left of the easterly end of Wissahissick Pond is East Marshfield, on the horizon twenty miles away; over the left portion of the pond, South Weymouth, nine miles. Looking about midway between Wissahissick and Ponkapog ponds, we see a long ridge thirty-three miles distant. This is Manomet Hill in Plymouth. Holbrook, seven miles, is seen directly under it. Midway between Wissahissick and Manomet, one sees, against the sky, Captain's Hill in Duxbury, surmounted by the Standish Monument, distant twenty-six miles. The steeple directly under it is in West Duxbury. The large village of Randolph, five miles off, is seen stretching from under the right base of Manomet to nearly over the left end of Ponkapog Pond. Ponkapog, being less than two miles distant, is apparently the largest pond in view. Just right of its centre is seen the city of Brockton, ten miles off. Midway between Brockton and the left end of the pond, we find East Stoughton, looking between which and Brockton we see, farther off, East Bridgewater. A little to the right of Brockton is North Stoughton church, five miles away. Over this, Campello; and, far beyond, Middleboro, twenty-four miles distant. About midway between Brockton and the right end of the pond, are the two spires of Bridgewater, seventeen miles, with West Bridgewater church nearer, but a trifle more to the right.

Turning nearly south, the large village, six miles off, is Stoughton. Nearly due south is the tower of the water-works in Fall River, about thirty-five miles distant; a portion of the city is seen at its right. More to the right is Reservoir Pond in Canton, three miles off. Over its right end is Great Meadow Hill in Rehoboth, at a distance of twenty-three miles. Just south-southwest is Oak Hill in Attleboro, a small sharp

peak twenty-two miles away. Under this peak we see Massapoag Pond in Sharon, and, still nearer, the villages in Canton. East Attleboro is seen just to the right of the peak.

Facing nearly southwest, the wooded hill eight miles off is Moose Hill in Sharon. Sharon village, seven miles, and Foxboro, twelve miles, are respectively one third and two thirds the angular distance from Oak Hill to Moose. Now turn nearly to west-southwest. Just as far to the right of Moose Hill as Oak Hill is to its left, is Franklin, seventeen miles away, where we see the cupola of Dean Academy, and several steeples, against a distant ridge. To the left of Franklin, one fourth the way to Moose Hill, rises Woonsocket Hill in Rhode Island, S. $54^{\circ} 35'$ W., twenty-eight miles distant. Spread along to the right of west-southwest is Norwood village, four miles off.

A trifle to the right of due west stands West Dedham church, upon a hill five miles off. At its right, more than forty miles distant, is Leicester church-spire. Nearly in line with this lies Hopkinton, twenty-one miles. Considerably to the right stretches a low distant ridge, Asnybursket Hill in Paxton, 1,407 feet high and distant forty miles. A little to the right of west-northwest is Wachusett, the most conspicuous mountain in view. It is situated in Princeton, is 2,018 feet high, and forty-four miles away. Just at its left is Little Wachusett; as much more to the left, Princeton village, forty-two miles off. A trifle to the left of Princeton, and exactly west-northwest, Marlboro is seen, twenty-five miles. Under these two villages lies Natick; and, still nearer, South Natick. Turning back two thirds of the way from Wachusett to Asnybursket, we see on the horizon Rutland church, forty-four miles distant. A little to the right of Wachusett is Nobscot Hill in Framingham, about twenty miles off, nearly under which is Wellesley College, a cluster of brick buildings, eleven miles distant. Far to the right of Wachusett is Mt. Watatick in Ashburnham, 1,847 feet high, and fifty-two miles distant. It resembles a great haystack, and is nearly over the court-house dome in Dedham, which we see at its left, only four miles away. Asnybursket, Wachusett, and Watatick are the principal summits of a range sometimes called "The

Backbone of Massachusetts," crossing the State from north to south. This range we may follow in New Hampshire by Kidder, Spofford, Temple, Pack-Monadnock, and Crotchett mountains. Beyond this range, a trifle to the right of Wata-tick, stands the Grand Monadnock in Jaffrey, representing the main range of New Hampshire. It appears as a sharp peak, falling away gradually to the right. It is 3,177 feet high, and sixty-seven and one half miles distant.

A little to the right, and exactly northwest, we see Mt. Kidder in New Ipswich; then across Spofford's Gap is Spofford Mountain in Temple, and the sharper Temple Mountain. Next on the right we see the Pack-Monadnock, a remarkable mountain near Peterboro, with two similar summits connected by a short ridge. The northern peak is just sixty miles distant. Its height is 2,260 feet; that of the southern peak, 2,280 feet. In range with this mountain lies Sprague's Pond, two miles off. The next mountain group to the right is in Lyndeboro, N. H., a low ridge with two summits, of which the right-hand one, called Lyndeboro Pinnacle, is sixty miles distant. Over the left side of Pinnacle is Crotchett Mountain in Francestown, sixty-six miles off, bearing N. $35^{\circ} 15'$ W. A little to the right of Pinnacle, N. $30^{\circ} 24'$ W., is Prospect Hill in Waltham, fourteen miles distant, a rounded hill with a smaller summit rising from its left, balanced by a spur from its right flank. Between Pinnacle and Prospect we see Lincoln, on a hill eighteen miles away. At the right base of Prospect lies the village of Waltham, over which is Joe English Hill in New Boston, N. H., distant fifty-eight miles. Further to the right, about north-northwest, are the twin Uncanoonucs in Goffstown, N. H., about fifty-nine miles distant. The right-hand peak is nearly over Readville schoolhouse. Just to the right of this building in the foreground stretches the large village of Hyde Park, three miles distant, and, nearly over its most prominent church, are seen, in the distance, the spires of Arlington. To the west and northwest we also look down upon the meadows of Neponset River, which stream we can follow for several miles. Directly under the two summits of Pack-Monadnock, we get glimpses of Charles River. Some one of several hills about west-southwest may prove to be in Connecticut, but it is doubtful.

The most of these interesting features of the view can be seen with the naked eye, or merely an opera-glass. I have identified some prominent building in one hundred and twenty-five villages, and sighted many others, of the location of which I am at present doubtful, but many of these can only be seen with a telescope, and others cannot easily be described in an article of this length.

On the Mountains of Eastern Cuba.

By W. O. CROSBY.

Read December 18, 1882.

THE three departments, — Occidental, Central, and Oriental, — into which Cuba is divided by political boundaries, are found to be very natural divisions when topographically considered ; but the contrast is especially striking between the two departments first named and the Oriental department. The western departments, including all that part of the island west of the meridian of Cape Cruz, are, for land in the Greater Antilles, low and level. Elevations of more than 1,000 feet are rare, and the highest points are less than 2,500 feet above the sea ; while many considerable towns are situated midway between the northern and southern coasts, and railways traverse the interior of the island, crossing repeatedly from coast to coast.

The Oriental department, on the other hand, is, for the most part, high and mountainous. Extensive tracts have an altitude of more than 2,000 feet, with numerous summits rising to double this height ; while the noble Sierra Maestra — rising abruptly from the Caribbean Sea, and skirting the southern coast from Cape Maysi to Cape Cruz, a distance of 250 miles — reaches, in Pico de Tarquino, according to the maps, an altitude of 8,400 feet. The northern coast is bordered by a broader and less distinct range, the summit of which is more remote from the sea. From Cape Maysi, the extreme eastern end of

the island, as far west as the meridian of Santiago, — about one hundred miles, — these two ranges are united in one solid mountain mass; but farther west they diverge, enclosing the broad valley of the Rio Cauto and the Bay of Buena Esperanza. Owing to the rugged nature of the country, which reduces to narrow limits the area that can be cultivated, the towns are few and small, and are nearly all found in the immediate vicinity of the coast, and it may be safely predicted that a railway will not soon cross the island within two hundred miles of Cape Maysi.

Under the influence of a warm and moist climate, the basic rocks, of which these mountains are chiefly composed, yield an abundant soil. But, although the surface is in consequence rarely broken by crags or precipices, the slopes, owing to the rapid erosion of the bottoms of the valleys during the elevation of the island, are, as a rule, very steep, often steeper than would be possible among our northern glaciated mountains, where the superficial detritus, or soil, does not shade off gradually into — *i. e.*, has no hold upon — the underlying solid rocks, but rests insecurely upon a surface which is hard, smooth, and often polished. That the limit of steepness is often reached in the Cuban mountains is evidenced by the fact, which I have frequently observed, that the original intimate relations of the rocks and soil are not always preserved, but the latter often rests, as in higher altitudes, upon a well-defined and comparatively hard surface, being evidently transported. In fact, there can be no doubt that over large areas the soil is slowly sliding into the valleys and the sea, and taking on the structure and general aspect of the northern drift. I have looked in vain, however, for rock-surfaces that were grooved or polished in the direction of this creeping motion, though it may be that excavations made for that purpose would expose them. The downward progress of the soil is not always insensible, but during the rainy season considerable landslides sometimes occur, laying bare acres of half-decomposed rocks.

The generous rainfall enjoyed by this part of Cuba, probably not less than one hundred inches annually, gives rise to numerous streams, which — whether we regard the almost perfect transparency of the water, or the beds, now narrow and broken

by cascades and rapids, and again, broad, smooth, and paved with many-tinted pebbles which flash in the sunlight with kaleidoscopic effect, or the overhanging banks of tropic verdure, and the enclosing mountains — must be classed among the most beautiful in the world. The volume of water in many of these streams is very great, considering the nearness of their sources to the sea. The valleys are deep, and often, even in their upper portions, reach down almost to sea-level, exposing the very axis of the mountains; so that the rivers have usually but little fall until we near their sources, where they have carved many a fine amphitheatre, reducing the dividing ridges to crumbling knife-edges.

As I have already pointed out, Oriental Cuba rises much more abruptly from the southern than from the northern shore, and this difference is emphasized when we compare the depths of the adjacent seas. The deepest water in the Caribbean Sea is found in a narrow trough lying near to and parallel with the base of the Sierra Maestra, and having its axis within twenty to forty miles of the Cuban coast. The greatest depth yet measured in this trough is 3,138 fathoms (18,828 feet); and between the bottom of this abyss and the summit of Pico de Tarquino, not more than forty or fifty miles distant, there is a difference of level amounting to over 27,000 feet; so that this is clearly one of the grandest slopes on the globe.

On the other hand, the greatest depth yet observed between Cuba and the Bahamas is only about one half that just noted, or 1,554 fathoms. If the sea should retire from this end of Cuba, the existing mountains would appear of Himalayan proportions, having an altitude of over 27,000 feet on the south and 17,000 feet on the north, while the present contrast between the inclinations of the northern and southern slopes would be essentially unchanged.

For a hundred miles west of Cape Maysi, or as far as the northern and southern ranges are united, the watershed, or dividing crest, is not more than one third of the breadth of the island from the Caribbean shore. But the northern and southern slopes are contrasted in other respects besides their breadth and inclination. There is a marked climatic difference, the southern coast being much dryer than the northern.

The prevailing wind here, as throughout the West Indies, is the northeast trade. The Caribbean slope is protected from this by the mountains, and is sensibly warmer in consequence. But, what is of greater moment, the moisture with which these winds are laden is mainly precipitated on the broad northern slope. Of this unequal precipitation, one can have ocular demonstration on almost any day in the year. The normal daily programme of the weather is about as follows :—

The nights and mornings are usually either calm, or there is a light land-breeze. Toward the middle of the forenoon, and while the sky is yet clear, the sea-breeze, or trade-wind, sets in, and gradually increases in strength till the afternoon is well advanced, when it gradually declines, dying out as night approaches. When the forenoon trade-wind strikes the cool upper slopes of the mountains, the watery vapor is condensed and clouds (usually *cumuli*) begin to appear. The cloudiness increases until a continuous cloud-belt is formed, extending east and west as far as the eye can see, but always of very limited breadth. From any moderate eminence, or from a mile or two off the north coast, it can be distinctly seen that the clouds do not extend far south of the summit of the range, enveloping the higher peaks and ridges, while through the lower passes clear sky appears beyond ; but toward the north the cloud-belt may cover the shore, or extend several miles out to sea.

On many days, especially in the dry season, the clouds do not form a distinct and continuous belt, and their development is not followed by rain ; as a rule, however, local showers commence in the middle of the day, and continue over different parts of the mountains during the afternoon. From a short distance out at sea I have observed four or five showers in progress at the same time. Occasionally the precipitation becomes general along the whole line, and heavy rain falls on the sea as well as on the mountains ; but even the casual observer will soon discover that the rainfall is much greater about the sources of the streams, on the higher slopes of the mountains, than in the neighborhood of the coast. When the land-breeze sets in at night, the cloud-belt is carried out to sea, and may often be seen in early morning resting on the northern horizon, before it is dissipated by the advancing sun.

During the prevalence of general storms, the rain falls more or less uniformly over the entire breadth of the island ; but at all other times the precipitation, as I have shown, takes place mainly on the north side of the mountains, the clouds rapidly disappearing in invisible vapor as they are carried by the trade-wind over the heated southern slopes.

The traveller from the northern to the southern coast will find, even in the dry season, that, for the last five or ten miles before crossing the divide, the deep and stiff red-clay soil is thoroughly saturated with water, and that the road, or rough mountain trail, is muddy as only West Indian roads can be. The abundant rains clothe the upper portions of the mountains with heavy forests ; and as the soil, thus protected from the sun and wind, cannot dry up, the mud is in consequence perennial. Throughout the mountains, the so-called roads are mere paths, upon which vehicles are entirely unknown, and upon which no labor is ever expended by man, except in prying out horses and mules that have become helplessly mired in the stiff and almost bottomless mud. Consider that the path, or river of mud, is usually either ascending or descending the sharp and steep mountain ridges ; that it is otherwise unpleasantly diversified by ledges, — now rough and again dangerously smooth, — and innumerable bowlders, logs, and roots, and you have a very fair picture of a Cuban mountain-road ! Sometimes the path turns and runs a good part of the way in the bed of the stream, or crosses continually from bank to bank, apparently to avoid the mud ; although the slippery ledges and bowlders over which the horse then flounders are almost as disagreeable and even more dangerous. Over the infrequent level stretches, the road is often a perfect network of narrow tracks for a width of a hundred yards or more, each person endeavoring to find a place where no one has gone recently. In fact, the best rule for travellers over many West Indian routes is to avoid going anywhere where they can see any signs of a road. Mr. Gabb, in his report on the geology of San Domingo,¹ the topographic and climatic conditions of which are very similar to those of eastern Cuba, gives the following condensed but truthful statement of what mountaineering means

¹ Trans. Amer. Phil. Soc., Vol. XV., new series, part 1.

in the Greater Antilles : " It means to ride all day in the wet woods and undergrowth, almost out of reach of sunlight, wading through mud knee-deep to the horse, obliged repeatedly to dismount to extricate the poor brute from the sloughs, scratched by thorns, cut by the sharp-edged grass, and splashed to the eyes with not over-fragrant mud."

The foregoing descriptions apply to most Cuban roads in the wet season, and to those upon the upper northern slopes of the mountains at all seasons. When, however, — except at the height of the rainy season, — we cross the watershed to the southern slope, a marked change in the aspect of nature is immediately observable. The road becomes dry and even dusty ; the grass, before fresh and green, is now dead and dry ; the dense forest has disappeared, except in the bottoms of the valleys, and the scattering trees include no pines or tree-ferns, both of which are abundant on the north side ; but forests of cactus abound, especially on the low land near the coast, and the streams, which are like winding oases in the desert, are comparatively few and small.

The rocks composing the mountains of eastern Cuba — at least within one hundred miles of Cape Maysi, which is as far as my observation extends — fall naturally into three distinct groups. First, in order of time and importance, are the eruptive rocks. These form the main mass of the mountains at most points. They appear on the shore in some places, and seem to be almost the only rocks found at greater distances than five or ten miles from the coast. They are, in the main, quite coarsely crystalline, and appear to include only the more basic kinds, such as diabase and felsite. The eruptive rocks are all old. There are no volcanoes, and no rocks that can be properly described as volcanic, in this region.

Next in order come the older stratified rocks, — the schists and slates. These are of various ages, some, the metamorphic varieties, being as old as the Cambrian, or older, while others are as new, probably, as the Cretaceous. But, so far as I have observed, all are alike unfossiliferous ; and, in consequence, the precise determination of their stratigraphic positions is a difficult problem. The schists and slates occur principally in two irregular belts running parallel with the coasts, and

lying one on either side of the great eruptive belt. Hence, they are found mainly on the *flanks* of the mountains. The stratified rocks, especially along their contact with the eruptives, are penetrated by numerous tongues and dikes of the latter; but whether they are older than all of the eruptive rocks, I have been unable to determine, because the eruptives are themselves of several distinct ages.

The eruptive rocks and the stratified rocks just described form only sharp, serrated mountains and ridges, the slopes being usually very steep, but rarely vertical. The Spaniards have, with considerable propriety, given the name *cuchillas* (knife-edges) to the ranges having this composition and structure.

One of the most striking, and, to the northern eye, one of the most novel features presented by the island of Cuba — when viewed from the sea or from salient portions of the coast — are the broad, level, and vertical-walled terraces or shelves of rock, which rest against the jagged mountains of the interior and form the shore around almost the entire island. I have observed these terraces lying at various levels from twenty up to nearly two thousand feet above the sea. Even when seen from a distance, and for the first time, the observer feels satisfied that they must be composed of horizontal beds of either some sedimentary rock or of basalt.

Landing on the first terrace, — which for hundreds of miles has a sensibly uniform altitude of about thirty feet, and is unbroken, save where rivers have been cut through it to reach the sea, — the most casual observation shows that the indescribably jagged and ragged rock is a limestone, and largely made up of several kinds of modern-looking corals. In other words, the terrace is a fringing coral-reef that has been lifted above the level of the sea; and looking from the perpendicular front of this ancient reef we can see distinctly that the adjacent sea-bottom is paved with growing hemispheres of *Astrea* and *Meandrina* — the summit of a new reef which will probably be elevated in its turn.

This lowest platform varies in width from a few rods to a mile or more. Sometimes the ground descends away from the shore, indicating that the reef, during its formation, was a bar-

rier reef at these points. Near the landward side of the reef, and especially toward the bottom, as may be observed in the natural sections, the coral-limestone is interstratified with layers of sand and gravel, material washed from the hills while the reef was growing. These beds are generally horizontal or slightly inclined toward the sea. As we should naturally expect, this fragmental material is most abundant near the mouths of the rivers, where the reef is sometimes principally composed of it, showing that the modern river-valleys are older than the reef.

The second reef rises steeply, often perpendicularly, from the inner edge of the first; and, along the north coast, where most of my observations were made, its altitude varies from 200 to 250 feet, the variation being due to unequal erosion. This reef, owing to its longer exposure to the agents of denudation, is much less continuous than the first, and more frequently reposes directly upon the ancient and non-calcareous mountains, though a well-marked valley often intervenes, running parallel with the reef and the coast. Being much older than the lower reef, the limestone is distinctly more crystalline, and the corals and shells are in great part obliterated; so that much of the rock appears quite destitute of organic remains. But the points of resemblance between the two reefs are sufficient to show that they are identical in origin. The altitude of the third reef is about 500 feet. It differs from the second very much as that differs from the first, having suffered greater erosion and being still more solid and crystalline. The same is true concerning the relations of the third reef to the fourth, which can be observed only at infrequent intervals along the coast. In the neighborhood of the Yumuri River, fifteen to twenty miles east of Baracoa, it is well preserved, with an elevation of probably not less than 800 feet.

These limestone-terraces, or ancient coral-reefs, constitute, of course, the third and newest of the three formations to which I have referred as composing the mountains of Cuba; though I have not yet shown that they participate in the formation of mountains of any considerable altitude. These reefs extend, with slight interruptions, around the entire coast of Cuba;

and in the western part of the island, where the erosion is less rapid than farther east, they are the predominant formation, and are well preserved on the summits of the highest hills. Mr. Alexander Agassiz states that the hills about Havana and Matanzas, which reach a height of over 1,200 feet, are entirely composed of reef-limestone.

Five miles west of Baracoa, and thirty miles from Cape Maysi, rises a singularly bold and interesting mountain called by the Spaniards *El Yunque*, or The Anvil. It is a very prominent landmark, known to all sailors in these seas, and indicated upon nearly all maps and charts of eastern Cuba, the altitude, when given, ranging from 2,500 to 3,000 feet. It stands about four miles, in a direct line, from the sea, with only slight undulations of the ground intervening, so that the eye takes in the entire altitude at a single glance. This probably accounts for the fact, of which I have no doubt, that the altitude of the mountain has been very generally and very greatly over-estimated. I have visited the summit twice, and my closely accordant observations with the aneroid and plane-table show that the true altitude cannot vary far from 1,800 feet. The ground plan of the mountain is distinctly rectangular, and at the summit it is about three fourths of a mile long and one third as broad, with the longer axis parallel with the coast. The slopes, except at the two or three points where ascent is possible, are vertical or nearly so for the first 300 to 600 feet below the summit.

The form of the mountain points very clearly to its origin, and before making the ascent I felt that it must be simply the last remnant of an ancient coral-reef, differing from those already described chiefly in its greater altitude. This theory was confirmed by observation. The base of the mountain, up to a height of about 800 feet, is composed mainly of the ancient eruptive rocks of the island, with some slates; while upon this foundation rests not less than 1,000 feet of limestone, forming the entire upper half of the mountain. The limestone is crystalline, and I observed in it no traces of corals or other organisms. In fact, it is very unlike the modern reef-rock, and, taken by itself, there is little evidence that it had a similar origin. But when, as its form warrants, we regard El

Yunque as the highest and oldest of a series of reefs, and compare it with the reef approaching it most nearly in altitude, and that with the next in descending order, and so on down to the modern reef, the evidence is perfectly conclusive; for the differences at each step are of the same kind and in the same direction. Notwithstanding its solidity, the limestone of El Yunque weathers in the same irregular, ragged, and cavernous way as that of the lower reefs.

The erosion which has swept away, for a distance of many miles up and down the coast, all but this solitary remnant of a reef more than one thousand feet thick, must certainly have diminished the height of El Yunque by as much as 200 feet; and we may safely conclude that the original altitude of this reef was not less than 2,000 feet. On the island of Jamaica precisely similar reefs have been observed at an elevation of 3,000 feet; and Mr. Sawkins, in his report on the geology of that island, says that the reef-limestone has a maximum thickness of not less than 2,000 feet, and that the oldest of it was formed after the close of the Tertiary period.

The concentric coral-reefs of Florida, it is well known, have their summits all on nearly the same level, which is but little above the level of the sea, — constituting an important exception to what for the last forty years has been regarded as the general rule, *viz.*, that extensive coral-reefs are formed on areas of subsidence. Mr. Alexander Agassiz points out¹ that the great Alcaran reef, on the Yucatan Bank, which is atoll-like in form and stands on an area of elevation, is another exception to Darwin's theory; and he also adds both the ancient and modern reefs of Cuba to the list.

That Cuba has, in recent geological times, been an area of extensive elevation, the reefs fringing its mountains to a height of nearly 2,000 feet afford indisputable evidence. But does it necessarily follow that these reefs were formed while the land was actually rising? It is a fact well known to geologists that all great movements of the earth's crust are oscillatory. Thus during the Palæozoic era, the middle portion, especially, of the Appalachian system in North America, was an area of profound subsidence; but, although the general tendency

¹ Bulletin of the Mus. Comp. Zool., Vol. V., No. 1, p. 2.

was downward, the character of the sediments deposited during that time shows that the movement was frequently reversed, periods of elevation alternating with periods of subsidence, the latter however predominating. Similarly in the case of Cuba, during Post-tertiary time, this region experienced a powerful elevation; but there are good reasons for believing that the upward progress of the land was not uninterrupted. The reefs, in fact, are witnesses for both sides, testifying with nearly equal distinctness to both elevation and subsidence.

The coast of Cuba is probably not rising now, at least not at all points. On the beach near Baracoa, the erect stumps of large trees may be seen standing where they grew, near the low-tide mark. The numerous harbors of Cuba are nearly all formed on one plan, of which Baracoa Harbor is a good example. It is an approximately circular and almost completely land-locked basin, communicating with the sea through a narrow but deep passage between broken walls of coral-rock. The larger harbors depart from this plan chiefly in their more irregular outlines, all agreeing in having deep narrow mouths. Every harbor is at the mouth of one or more rivers, and their narrow inlets, as I conceive, are the work, not of the sea, but of the rivers at a time when the land was higher than now; while the main body of the harbor, in each case, is simply the broader and older portion of the river-valley behind the barrier-reef, which has been invaded by the rising sea. The circular form of many of the smaller harbors is largely due to the fact that the sand brought down by the rivers is thrown up by the sea into curved bars, cutting off the inequalities of the shore.

During the formation of the most recent of the elevated reefs, which, as already stated, forms a level floor about thirty feet above the sea, the mouths of the smaller streams were behind the reef, discharging into irregular channels or basins between the reef and the shore. On account of the turbidity and freshness of the water, the reef, especially on its inner border, grew less rapidly at these points than elsewhere, the basins behind the reef becoming filled with *débris* from the land. When the reef was finally raised to something above its present level, each river scoured out a large part of the sand and gravel which it had deposited, and cut a narrow

channel through the reef itself. During this period of elevation, Cuba, like most rapidly rising lands, had few harbors; but when subsidence began, the sea occupied the channels and basins which had been excavated and cleared out by the rivers, and thus a large number of harbors came into existence.

Opposite the mouths of the larger rivers, such as the Toar and Molasses in the vicinity of Baracoa, the reef in question was completely interrupted, and these streams discharge into broad, open bays; while the lower portions of their valleys show, equally with the harbors, that the land is sinking. They are half-drowned valleys, filled to a considerable depth with land detritus, conditions which could not exist if the land were rising or had recently risen.

But the most satisfactory evidence that the ancient reefs of Cuba were not formed during periods of elevation is found in the great thickness of the reefs themselves. The reef which, in eastern Cuba, reaches a height of 500 feet above the sea, includes not less than 400 feet in vertical thickness of coral-rock; and in this estimate no allowance is made for what the reef has lost by erosion. The giant reef of which El Yunque is, perhaps, the last remnant, has still, after suffering enormous waste, a thickness of more than 1,000 feet; while, according to Mr. Sawkins, the maximum thickness of the ancient reefs of Jamaica is 2,000 feet. It follows, from Mr. Agassiz's theory, that the El Yunque reef, for example, began to grow in water much more than 1,000 feet deep; for to the present thickness of the reef we must add, not only what it has lost by erosion, but also the amount of elevation which took place during the ages when the reef was growing. A depth of even 1,000 feet is, however, entirely inadmissible, in view of the well established fact that reef-building corals are limited to depths of less than twenty fathoms.

We have, then, apparently, no resource but to accept Darwin's theory as an adequate explanation of the elevated reefs of the Greater Antilles; and, therefore, to admit that the upheaval of this portion of the earth's crust has been interrupted by periods of profound subsidence during which the reefs were formed.

The subsidence of 2,000 feet, of which El Yunque is a monu-

ment, must have reduced the Greater Antilles to a few lines of small, but high and rugged islands ; and, as Mr. Bland has shown, fully accounts for the absence, in these immense tracts, of all large land-animals, although they were abundant here in Pliocene and earlier times.

It is interesting to observe the wonderful unity in topography and geologic structure presented by the Greater Antilles. So far as I have been able to learn, each member of the group consists of an axis of old eruptive rocks, flanked on either side by schists and slates, and other sedimentary formations, and by elevated coral-reefs. Cuba and Jamaica are parallel islands, and are highest toward the east, reaching elevations of 8,400 and 7,000 feet respectively ; while the mass of San Domingo and Porto Rico, which, in view of the shallow water (250 fathoms) between them, may be regarded almost as one island, rises toward the west, the highest points being 7,000 to 9,000 feet above the sea. In the eastern ends of Cuba and Jamaica and the western half of San Domingo we have the culmination, not only of the Greater Antilles, but of the entire West Indies. And in this connection it is important to notice that the deepest water in this part of the world is, as I have already pointed out, that encircled by these greatest heights of land.

Professor Dana long ago called attention to the fact that the reliefs of this region show two dominant trends. Porto Rico presents one east-west range, which is continued in San Domingo ; but about the middle of the latter island the mountains divide. One range continues nearly due west, parallel with the southern coast. Jamaica is an east-west mountain range lying in the same latitude with the southern arm of San Domingo, the greatest depth between being 600 fathoms ; while the Pedro, Rosalind, and Honduras banks, lying to the west-southwest with depths of less than 100 fathoms, connect this line of relief with Honduras. Returning to San Domingo, we find the northern branch of the mountains running in a west-northwest direction, parallel with the northern coast, and forming the northern arm of the island, which points toward Cape Maysi, on Cuba, although the intervening water is 50 miles across and over 800 fathoms deep.

Cuba, like San Domingo, begins as a single range ; but a

hundred miles west of Cape Maysi this divides. As before, the southern range, the Sierra Maestra, runs a little south of west, forming the coast to Cape Cruz, and being continued in the Little and Grand Cayman islands and the Ministeriosa Bank. The northern range, with the west-northwest trend, forms the main mass of Cuba; and regaining the western trend, points directly towards Yucatan, across a strait 120 miles wide and 1,164 fathoms deep. It is needless to point out that these indications of former land connections harmonize beautifully with Mr. Thomas Bland's conclusions, drawn from his study of the present distribution of the terrestrial mollusca.

A Trip to Roan Mountain.

BY J. W. CHICKERING.

Read June 14, 1882.

As the season for mountain explorations again approaches, a desire that this Club shall be truly Appalachian, instead of merely Montalban, leads the writer to give some notes of a trip to the high peaks of the southern Appalachians, with the hope that some of the members of the Club may be led to turn their footsteps in the same direction.

On the summit of Roan Mountain, at an altitude of 6,391 feet, within a few rods of the State line separating North Carolina from Tennessee, stands Cloudland Hotel, offering to the traveller the loftiest hotel accommodations to be found east of the Rocky Mountains. It is reached from Washington *via* the Virginia Midland; Atlantic, Mississippi & Ohio; and East Tennessee, Virginia & Georgia railroads. From Boston one would go either by way of Washington, or by steamer to Norfolk. Round-trip tickets are sold from Washington to the summit of the mountain and return, for \$27.50.

Leaving Washington at half-past seven in the morning, we are about seven hours in reaching Lynchburg, some 200 miles,

through a country not specially interesting, save for its historical reminiscences. This ride can be hot; we had the mercury at 96° for several hours.

Almost immediately, however, we begin to ascend. At Liberty, in full view of the beautiful peaks of Otter, we are 967 feet above sea-level. Soon we cross the Blue Ridge at an elevation of 1,285 feet, and the mercury begins to fall in the thermometer as well as in the barometer. At Christiansburg the welcome call to supper greets us, and we step out of the car to a delicious meal — with coffee and “chick’n,” hot rolls, cold milk and berries with plenty of ice — 2,000 feet up in the air. At Rural Retreat station we reach an altitude of 2,520 feet, and nowhere during the remainder of our journey does the railroad run below 1,500 feet. At midnight we leave the cars at Johnson City, and, after a brief but warm night’s sleep, are called to a bountiful table spread with chicken, steak, corn-bread fit for a king, cakes, coffee, hot biscuit, honey, preserves, jelly, jam, and every imaginable good thing, till our only regret is the physical limitations of material bodies.

At sunrise our party of twenty-five, suitably bestowed in three *hacks*, in Southern parlance, — or in Yankee dialect *mud-wagons* — with four horses each, starts off in exhilarating style for a twenty-five-mile drive over Tennessee and North Carolina roads, which are almost a liberal education.

For ten miles we follow up Buffalo Creek in a southwesterly direction, up and down clayey hills washed into ruts that seem impassable, through the bed of a stream strewn with bowlders for a mile, through sloughs, and over ledges. We are in a limestone region (the water so hard as to be unsafe for strangers to drink freely) presenting characteristic Virginia vegetation, — forest, wild flowers, crops, and weeds, sassafras patches, blackberry briers, persimmons, chinquapins and all. Then, turning to the southeast, we cross a slight divide, and half a mile lands us, apparently, in New England. Groups of hemlocks, pines, and sugar-maples, with huckleberry bushes and wintergreen, remind us of the North; but, associated with them, thickets of *Rhododendron maximum*, — just coming into flower, with every shade, from pure white to dark pink, — *Leucothoe Catesbæi*, *Calycanthus floridus*, *Oxydendron arboreum*,

Magnolia Fraseri, and other unfamiliar shrubs and flowers, prove to us that we are still in Dixie, but have made a transition from limestone to granite, or, as they call it, freestone. The water is pure and cold, and we make up for our enforced abstinence.

We stop at noon at a typical mountaineer's house, where our lunch-baskets prove more appetizing than the prevailing style of cooking.

A couple of miles more of winding around the heads of ravines, and zig-zagging up mountain defiles, bring us to the summit of the Iron Mountain range, the dividing line between Tennessee and North Carolina; and for the first time we look off upon the glorious outline of the Roan, some six or eight miles distant in a straight line, separated from us by a deep valley, and rising some 2,000 feet above our heads.

Our careful Alfred, prince of ebony drivers, alights, examines carefully harness and coach, and, with the remark, "We've got to go down like a streak; but you needn't be afeard, it's all right," cracks his whip, and away we go down the steep incline, — the four horses doing their best, and the stout brakes being the only apparent obstacle to our destruction, — whirling round sharp corners, rattling over stones, bumping across corduroy bridges, splashing through the bed of the noisy creek, till, in a marvellously short time, we bring up at the Forge, in the valley of Big Rocky. We exchange greetings with Captain Jenkins, a former captain of Union Cavalry during the war, and start on our seven and a half miles pull up the mountain. The road was skilfully engineered and constructed, with a grade of one foot in ten, by Mr. Searle, the proprietor of Cloudland Hotel, and is a marvellous specimen of crooks and turns.

We begin the ascent. After perhaps a mile, a mountain shower bursts upon us, and in a trice the clayey soil is as slippery as so much soap, and horses and coaches slide about in a way trying to weak nerves. Soon we come to the belt of giant trees, at an elevation of 3,000–4,000 feet, where we see hundreds of chestnuts, sugar-maples, lindens, tulip-trees, yellow-birches, black-cherries, and other trees, from four to seven feet through, and sixty to seventy feet to the first limb. One

chestnut measured twenty-four feet in circumference, and one black cherry, nineteen feet. One prostrate and decaying trunk would supply a dozen poor families with fuel for months.

Soon we leave the clayey soil, and wade through the deep rich black mould, which is admirable for vegetation, but detestable for road-making. The turns become perilously short, the precipices unpleasantly high, till at last, on Blue Rock, the road is blasted through the rock, with a sheer descent of eighty feet on one side.

But all things have an end, and, after five hours of climbing, we reach the summit, 6,391 feet in the air, just as the sun, in a blaze of glory, is looking through his misty veil as he sinks to rest. All day long it has been oppressively hot, but as we near the summit, wraps are in demand; and as we enter the hotel, the rousing fire in the big fireplace, with half a cord of wood, more or less, is a welcome sight. And here for nine weeks we breathe mountain air, eat mountain food, and feast our eyes on mountain scenery. Once the mercury reaches 75° ; seven times only is it above 70° ; once it falls to 45° , and three times below 50° , — the general daily extremes being between 55° and 65° . Hay-fever patients are here completely relieved. One lady, who had visited nearly all the hay-fever resorts in the country, gave as her experience, that, while at most of them she had been benefited, here she found absolute exemption.

The barometer-mean is a little below 24 inches, and the total variation was only .32 of an inch. Eggs require fifteen to twenty minutes to be boiled hard, and potatoes an hour and a half to be boiled soft. The effect upon pedestrians is that while they require to rest often, there is so much of exhilaration in the air, that they can and do walk five or ten times as far, with less fatigue than at home.

The view from Roan is glorious, and totally unlike the northern Appalachian scenery. Mountains to right of us, mountains to left of us, stretching away on every side to the horizon, — mountain monarchs, every one, — scores over 6,000 feet in height. Hardly a level acre is in sight; even the valleys are 2,000 or 3,000 feet above sea-level; and in all this wide expanse, only one little glimpse of water, where, a dozen miles away, the Nolchucky is hurrying on to the Tennessee.

On the south we look up to the Black Mountain range, with Mitchell's High Peak, on which rest the bones of its intrepid explorer, rising more than 300 feet above us. On the east and southeast, the Blue Ridge is in sight, with Grandfather and Grandmother mountains, and countless unnamed peaks. On the north and west the great plateau of Tennessee, with the Clinch and other ranges — or, rather, plateaus, twenty or more in number — stretch away in long parallel lines, as level as so many railroad embankments, sometimes for forty or fifty miles, with no apparent gap or break, till, in the dim distance, the blue line of the Cumberland range outlines the horizon.

The cloud views are grand beyond description. Often, in the early morning, the whole country will be covered with a mass of pure white vapor, like the waters of a shoreless sea, with only here and there a mountain top, like an island, emerging from the billows. And then, as the rays of the rising sun fall upon them, they assume tints of pink and crimson and gold; and soon, with the morning breezes, they melt away, and the landscape stands revealed in all its freshness and beauty.

Rarely, on the clearest day, can you stand for half an hour upon one of the high peaks, without seeing showers and local storms, sweeping over the country in various directions; often several may be seen at once. Not infrequently one takes a turn and comes over us with most unwelcome suddenness, though very often they are below us. On two sides of the mountain, deep gullies or ravines come nearly to the mountain-top, so that you may stand on an almost perpendicular precipice, and look down into a gulf from 1,000 to 2,000 feet deep, at your very feet, and see the clouds form far below, as a moist air from the valley sweeps up the gorge and meets the cooler temperature of the upper heights.

Of the flora I might write at length, but a paper on that subject, in the last volume of APPALACHIA, contains all necessary information.¹

The mountain is in its glory in June, when the clumps of *Rhododendron Catawbiense*, with which the grassy slopes of the summit are dotted, are in flower, forming great domes,

¹ Appalachia, Vol. II. pp. 277-279.

five to ten feet high, of dark-pink flowers, so that the whole mountain-top seems to be in bloom. Add to this, large patches of *Rhododendron calendulaceum*, varying in color from orange to crimson, so that the mountain seems aflame, and you will no longer wonder that Dr. Asa Gray deemed it worth the journey, merely to see Roan in June.

Variation of Barometric Measurements of Altitude with the Season.

BY JOHN TATLOCK, JR.

Read June 14, 1882.

THE labors of the principal investigators in the science of Barometric Hypsometry have generally resulted in establishing the law, that the barometrical difference of altitude between two places is less in winter than in summer.

Professor Whitney, in the preface to his Contributions to Barometric Hypsometry, says: "And by repeated measurements . . . I arrived at the conclusion that our results were always lower in cold weather, or at morning and evening, than they were in warmer weather or towards noon." Here he refers to the region around Lake Superior. On page 36 of the same work, speaking of the results reached in his California investigations, he says: "The results are lower in winter than in summer. This must be regarded as universally true."

Colonel Williamson, on page 214 of his paper, "On the Use of the Barometer," referring to the discussion of the observations made at Geneva and the Grand St. Bernard, says: "The curves of differences of altitude . . . all tend to show that the results in midsummer are much greater than in midwinter;" and on page 216: "It would appear from all the examples thus far examined, that the general law, deduced from the observations at Geneva and the St. Bernard, is equally applicable to the Sierra Nevada."

In APPALACHIA, Vol. II. page 201, Professor Charles R.

148 VARIATION OF BAROMETRIC MEASUREMENTS

Cross has published a discussion of some of the U. S. Signal Service observations taken at the summit of Mt. Washington, N. H., and at Portland, Me. The results of this discussion develop the unexpected fact that the differences of altitude computed from the winter observations are greater than those computed from the summer observations.

In the following pages is presented a discussion of observations made at Mt. Washington, and at Portland, Me., Burlington, Vt., and Boston, Mass.

Using the three latter points as lower stations, successively, I have computed the differences of altitude between them and Mt. Washington, using both the formula of Laplace and Plantamour, as will be seen in the tables here given.

The latitudes &c, of the stations are as follows:—

Station.	Latitude.	Elevation by spirit-level.	Air-line distance from Mt. Washington.
		Feet.	Miles.
Mt. Washington.....	44 16	6285.60	0
Portland.....	43 40	45.39	72
Burlington.....	44 29	267.99	95
Boston	42 21	142.19	140

The elevations refer of course to the cistern of the barometer at the several points.

The data used in this discussion have been taken from the Reports of the Chief Signal Officer, U. S. Army, and principally from the volume for 1879.

Tables 1-4 contain the values from which the altitudes were computed. Each table is divided into two parts. Part I. contains the mean monthly values of the atmospheric pressure, temperature, and humidity, from July 1878 to June 1879, inclusive. Part II. contains the normal monthly values for the six years 1873-78, inclusive.

The barometer readings have been corrected only for temperature and instrumental errors.

From the data contained in tables 1-4 have been computed the differences of altitude given in tables 5-7. These tables are divided into two parts, to correspond with the two parts of tables 1-4, and the differences of altitude have been computed by the formulas of both Laplace and Plantamour.

TABLE I.

I.				II.			
MEAN VALUES FROM JULY, 1878, TO JUNE, 1879. MT. WASHINGTON, N. H.				NORMAL VALUES FOR THE SIX YEARS, 1878-78. MT. WASHINGTON, N. H.			
Month.	Barometer.	Temperature.	Humidity.	Month.	Barometer.	Temperature.	Humidity.
July	23.865	50.4	.796	Jan.	23.898	5.7	.912
Aug.	23.815	47.0	.910	Feb.	23.367	6.5	.869
Sept.	23.974	48.5	.832	Mar.	23.899	12.8	.886
Oct.	23.782	83.3	.878	April	23.542	21.6	.891
Nov.	23.483	17.1	.927	May	23.702	32.1	.851
Dec.	23.272	6.5	.879	June	23.881	44.2	.851
Jan.	23.243	2.1	.849	July	23.894	48.3	.874
Feb.	23.288	-0.7	.853	Aug.	23.921	47.1	.852
Mar.	23.505	13.7	.898	Sept.	23.867	40.1	.835
April	23.416	17.5	.860	Oct.	23.691	29.8	.895
May	23.819	37.5	.808	Nov.	23.503	16.3	.890
June	23.773	42.8	.881	Dec.	23.404	8.7	.865
Mean	23.595	25.9	.864	Mean	23.626	26.1	.872

TABLE II.

I.				II.			
MEAN VALUES FROM JULY, 1878, TO JUNE, 1879. PORTLAND, ME.				NORMAL VALUES FOR THE SIX YEARS, 1878-1878. PORTLAND, ME.			
Month.	Barometer.	Temperature.	Humidity.	Month.	Barometer.	Temperature.	Humidity.
July	29.844	71.6	.688	Jan.	30.006	22.6	.732
Aug.	29.880	66.4	.779	Feb.	29.929	25.7	.714
Sept.	30.104	62.0	.765	Mar.	29.887	33.2	.697
Oct.	29.928	54.0	.772	April	29.874	42.4	.658
Nov.	29.833	40.0	.680	May	29.897	53.9	.634
Dec.	29.827	30.5	.513	June	29.901	62.8	.700
Jan.	29.880	24.2	.750	July	29.900	69.1	.712
Feb.	29.018	24.9	.728	Aug.	29.949	67.0	.788
Mar.	30.015	34.0	.734	Sept.	30.003	60.0	.722
April	29.778	42.6	.630	Oct.	29.947	49.9	.706
May	29.062	57.7	.664	Nov.	29.945	37.5	.702
June	29.868	61.8	.738	Dec.	29.942	27.9	.691
Mean	29.894	47.5	.682	Mean	29.932	46.0	.700

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TABLE III.

I.				II.			
MEAN VALUES FROM JULY, 1878, TO JUNE, 1879. BURLINGTON, VT.				NORMAL VALUES FOR THE SIX YEARS, 1878-1878. BURLINGTON, VT.			
Month.	Barometer.	Temperature.	Humidity.	Month.	Barometer.	Temperature.	Humidity.
July	29.654	78.2	.616	Jan.	29.818	19.4	.719
Aug.	29.611	69.2	.734	Feb.	29.755	21.1	.668
Sept.	29.879	63.2	.701	Mar.	29.693	29.7	.728
Oct.	29.741	53.1	.655	April	29.685	41.9	.692
Nov.	29.675	37.4	.714	May	29.692	55.2	.655
Dec.	29.653	24.7	.728	June	29.676	67.1	.656
Jan.	29.654	16.6	.731	July	29.687	71.4	.658
Feb.	29.722	16.1	.721	Aug.	29.736	69.4	.688
Mar.	29.764	28.4	.690	Sept.	29.788	60.1	.684
April	29.585	39.7	.579	Oct.	29.746	49.0	.683
May	29.717	61.1	.529	Nov.	29.763	34.8	.683
June	29.612	62.8	.680	Dec.	29.754	24.2	.707
Mean	29.689	45.5	.673	Mean	29.732	45.3	.685

TABLE IV.

I.				II.			
MEAN VALUES FROM JULY, 1878, TO JUNE, 1879. BOSTON, MASS.				NORMAL VALUES FOR THE SIX YEARS, 1878-1878. BOSTON, MASS.			
Month.	Barometer.	Temperature.	Humidity.	Month.	Barometer.	Temperature.	Humidity.
July	29.773	72.4	.664	Jan.	29.925	26.9	.734
Aug.	29.756	68.1	.737	Feb.	29.843	28.5	.713
Sept.	30.009	62.9	.753	Mar.	29.798	34.8	.694
Oct.	29.850	55.8	.681	April	29.772	43.4	.686
Nov.	29.763	39.9	.689	May	29.806	55.7	.630
Dec.	29.768	29.6	.696	June	29.813	66.3	.684
Jan.	29.768	24.5	.626	July	29.816	72.0	.696
Feb.	29.838	24.5	.661	Aug.	29.843	69.1	.728
Mar.	29.927	33.8	.737	Sept.	29.906	61.7	.727
April	29.707	42.4	.611	Oct.	29.854	51.7	.694
May	29.897	59.4	.618	Nov.	29.864	39.0	.702
June	29.790	64.2	.701	Dec.	29.863	30.4	.706
Mean	29.820	48.1	.689	Mean	29.842	48.3	.699

TABLE V.

COMPUTED DIFFERENCES OF ALTITUDE BETWEEN MT. WASHINGTON, N. H.,
AND PORTLAND, ME.

I. — Differences computed from mean values, 1878-79.

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
July	6217.5	—29.2	6245.0	—34.9
August	6206.7	—40.0	6236.8	—43.1
September	6222.8	—23.9	6241.0	—38.9
October	6217.5	—29.2	6248.8	—31.1
November	6230.8	14.1	6299.4	19.5
December	6239.1	42.4	6336.2	56.3
January	6245.6	— 1.1	6288.0	8.1
February	6251.7	5.0	6305.0	25.1
March	6272.0	25.3	6314.5	34.6
April	6252.5	5.8	6289.5	9.6
May	6202.8	—43.9	6229.8	—60.1
June	6231.9	—14.8	6260.9	—19.0
Mean	6246.7	0.0	6279.9	0.0

II. — Differences computed from normal values, 1873-78.

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
January	6246.1	9.4	6297.2	27.0
February	6237.9	1.2	6287.0	16.8
March	6265.7	29.0	6309.4	39.2
April	6223.4	—13.3	6259.7	—10.5
May	6214.7	—22.0	6244.2	—26.0
June	6214.6	—22.1	6242.5	—27.7
July	6205.9	—30.8	6234.7	—35.5
August	6198.5	—38.2	6227.1	—43.1
September	6217.6	—19.1	6245.3	—24.9
October	6228.7	— 8.0	6261.0	— 9.2
November	6257.3	20.6	6297.1	26.9
December	6240.5	3.8	6287.5	17.8
Mean	6236.7	0.0	6270.2	0.0

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TABLE VI

COMPUTED DIFFERENCES OF ALTITUDE BETWEEN MT. WASHINGTON, N. H.,
AND BURLINGTON, VT.

I. — *Differences computed from mean values, 1878-79.*

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
July.....	6050.0	— 1.8	6074.6	— 9.6
August	6021.3	—30.5	6050.2	—34.0
September	6021.6	—30.2	6052.9	—31.3
October.....	6043.5	— 8.3	6072.5	—11.7
November.....	6105.2	53.4	6144.3	60.1
December.....	6100.3	48.5	6148.0	63.8
January	6044.1	— 7.7	6098.3	14.1
February	6029.2	—22.6	6085.1	0.9
March	6018.4	—33.4	6060.0	—24.2
April	6063.7	11.9	6100.2	16.0
May.....	6002.9	—48.9	6027.2	—57.0
June.....	6003.3	—48.5	6030.0	—54.2
Mean	6051.8	0.0	6084.2	0.0

II. — *Differences computed from normal values, 1873-78.*

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
January.....	6063.3	— 2.7	6115.5	16.6
February	6058.8	— 7.2	6108.4	9.5
March	6074.2	8.2	6118.7	19.8
April	6054.3	—11.7	6089.9	— 9.0
May.....	6039.2	—26.8	6068.1	—30.8
June	6031.9	—34.1	6058.2	—40.7
July	6023.6	—42.4	6049.8	—49.1
August	6016.6	—49.4	6043.0	—55.9
September	6021.5	—44.5	6050.1	—48.8
October	6044.5	—21.5	6075.4	—23.5
November.....	6081.4	15.4	6120.7	22.8
December.....	6056.0	—10.0	6103.2	4.3
Mean	6066.0	0.0	6098.9	0.0

TABLE VII.

COMPUTED DIFFERENCES OF ALTITUDE BETWEEN MT. WASHINGTON, N. H.,
AND BOSTON, MASS.I. — *Differences computed from mean values, 1878-79.*

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
July	6156.4	—23.8	6182.6	—35.4
August	6149.2	—35.5	6178.9	—39.1
September	6141.7	—43.0	6170.5	—47.5
October	6155.9	—28.8	6185.5	—32.5
November	6199.2	14.5	6237.8	19.8
December	6232.5	47.8	6279.9	61.9
January	6196.2	11.5	6247.2	29.2
February	6185.9	1.2	6238.8	20.8
March	6195.4	10.7	6237.7	19.7
April	6189.1	4.4	6225.6	7.6
May	6155.9	—28.8	6181.1	—36.9
June	6175.9	— 8.8	6204.2	—18.8
Mean	6184.7	0.0	6218.0	0.0

II. — *Differences computed from normal values, 1873-78.*

Month.	Diff. by Laplace's Formula.	Variation from Mean.	Diff. by Planta- mour's Formula.	Variation from Mean.
	Feet.	Feet.	Feet.	Feet.
January	6209.2	25.0	6258.2	41.5
February	6185.2	1.0	6232.8	16.1
March	6201.0	16.8	6248.2	26.5
April	6140.7	—43.5	6176.4	—40.8
May	6145.0	—39.2	6174.0	—42.7
June	6153.1	—31.1	6170.4	—46.8
July	6147.2	—37.0	6175.6	—41.1
August	6118.7	—70.5	6141.8	—64.9
September	6140.8	—43.4	6108.3	—44.4
October	6158.3	—25.9	6190.0	—26.7
November	6197.9	13.7	6236.2	19.5
December	6192.1	7.9	6237.6	20.9
Mean	6184.2	0.0	6216.7	0.0

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In making these computations, the constant terms of the formula, which contain the corrections for latitude &c, have been omitted.

By an examination of the foregoing tables, or of the curves constructed from them, it will be seen, at once, that the conclusion reached by Professor Cross in his before-mentioned paper — that, in the White Mountain regions, barometrical differences of altitude are greater in winter than in summer — is fully corroborated. In every case the maximum difference occurs between November and March, and the minimum between May and September.

So far as I can ascertain, a variation of differences of altitude in this manner has never before been noticed, in the case of a series of observations extending over a considerable length of time.

If now we proceed to a comparison of the results derived from the use of the two different formulas, we shall reach another anomalous conclusion.

It will be found that the differences by the formula of Plantamour do not agree so well with the differences by spirit-level as do the differences by the formula of Laplace, a conclusion which, on the whole, is contrary to that reached by the best authorities on this subject. This point is illustrated by the following table.

TABLE VIII.

<i>Difference of altitude between Mt. Washington and Portland.</i>		
		Variation from spirit-level.
	Feet.	Feet.
By spirit-level,	6240.2	0.0
By Laplace's formula, mean 1878-79,	6264.7	24.5
" " " " 1873-78,	6254.7	14.5
By Plantamour's formula, mean 1878-79,	6208.1	57.9
" " " " 1873-78,	6288.8	48.1

TABLE VIII.—*Continued.*

<i>Difference of altitude between Mt. Washington and Burlington.</i>		
		Variation from spirit-level.
	Feet.	Feet.
By spirit-level,	6044.5	0.0
By Laplace's formula, mean 1878-79,	6092.2	24.7
“ “ “ “ 1878-78,	6083.4	88.9
By Plantamour's formula, mean 1878-79,	6101.7	57.2
“ “ “ “ 1878-78,	6116.4	71.9
<i>Difference of altitude between Mt. Washington and Boston.</i>		
	Feet.	Feet.
By spirit-level,	6143.4	0.0
By Laplace's formula, mean 1878-79,	6203.0	59.6
“ “ “ “ 1878-78,	6202.5	59.1
By Plantamour's formula, mean 1878-79,	6236.6	93.2
“ “ “ “ 1878-78,	6235.3	91.9

By an examination of the foregoing, it will be seen, besides the fact which it is intended to illustrate, that the barometric measurements give results uniformly too high.

I have merely touched upon the facts which the observations and reductions herein presented seem to show, without attempting to inquire into their causes. For this latter purpose the observations are not sufficiently extended, but we see here an attractive field for future investigation, for those who are interested in this subject.

In closing, I desire to express my acknowledgements to Professor Cross, whose paper first suggested to me the idea of making this investigation, and who has given me much help and encouragement in the preparation of the same.

List of Corresponding Societies.

THE following is the first published list of the societies, surveys, &c., with which the Club is in relations of correspondence and exchange of publications. The names of the periodicals, and the frequency of their issue, as well as the year from which the correspondence dates, are also given. The list is complete to the time of issuing the present number of APPALACHIA.

AMERICAN.

- Academy of Natural Sciences* (1880) Philadelphia.
Proceedings, irregularly.
- Adirondack Survey* (1880) Albany.
Reports, annually.
- American Museum of Natural History* (1881) New York.
Bulletin, irregularly.
- Cambridge Entomological Society* (1877) Cambridge.
Psyche, irregularly.
- Essex Institute* (1877) Salem.
Bulletin, irregularly.
- Geological and Natural History Survey of Canada* (1882) Ottawa.
Reports, irregularly.
- Geological and Natural History Survey of Minnesota* (1878) Minneapolis.
Reports, annually.
- New Hampshire Historical Society* (1882) Concord.
Collections, irregularly.
- Rocky Mountain Club* (1876) Colorado Springs.
- Torrey Botanical Club* (1882) New York.
Bulletin, monthly.
- United States Geological Survey* (1882) Washington.
Reports and Monographs, irregularly.
- Vermont Historical Society* (1877) Montpelier.
- White Mountain Club* (1877) Portland.

FOREIGN.

ALPINE CLUBS.

- Alpenclub "Oesterreich"* (1881) Vienna.
Oest. Alpen-Zeitung, fortnightly.
- Associació d'Excursions Catalana* (1879) Barcelona.
Butlletí, monthly; Anuari, annually.

Club Alpin Français :

- Direction Centrale (1883) Paris.
 Bulletin, monthly; Annuaire, annually.
 Section des Alpes Maritimes (1880) Nice.
 Bulletin, irregularly.
 Section d' Auvergne (1881) Clermont-Ferrand.
 Section de Saône-et-Loire (1881) Chalon-sur-Saône.
 Bulletin, irregularly.
 Section Lyonnaise (1881) Lyons.
 Bulletin, irregularly.
 Section du Sud-Ouest (1878) Bordeaux.
 Bulletin, irregularly.

Club Alpino Italiano :

- Direzione Centrale (1877) Turin.
 Rivista, monthly; Annuario, annually; Bollettino Decadico
 dell' Assoc. Meteor. Italiano, monthly.
 Sezione Fiorentina (1881) Florence.
 Scritti Varii, annually.
 Sezione di Vicenza (1882) Vicenza.
 Bollettino, annually.

Club Alpin Suisse :

- Comité Central (1883) Lausanne.
 Jahrbuch, annually.
 Section Genevoise (1881) Geneva.
 L'Echo des Alpes, quarterly.

Den Norske Turistforening (1877) Christiania.
 Årbog, annually.*Deutscher und Oesterreichischer Alpenverein :*

- Central Ausschuss (1881) Salzburg.
 Mittheilungen, monthly; Zeitschrift, annually, in parts.
 Section Frankfurt-am-Main (1881) Frankfurt.
Oesterreichischer Touristen-Club (1881) Vienna.
 Oest. Touristen-Zeitung, monthly; Jahrbuch, Chronik, annually.
Siebenbürgischer Karpathenverein (1881) Hermannstadt.
 Jahrbuch, annually.
Società Alpina Friulana (1880) Udine.
Società degli Alpinisti Tridentini (1883) Rovereto.
 Annuario, annually.

GEOGRAPHICAL SOCIETIES.

- Gesellschaft für Erdkunde* (1881) Berlin.
 Verhandlungen, monthly, ten times a year.
Imp. Russkoye Geographicheskoye Obshchestvo (1881) St. Petersburg.
 Izvestiya, annually, in irregular parts; Ottchet, annually.
Kais.-königliche Geographische Gesellschaft (1883) Vienna.
 Mittheilungen, annually.

- Royal Geographical Society* (1881) London.
 Proceedings, monthly.
- Sociedade de Geographia* (1881) Lisbon.
 Bolletim, annually, in parts, irregularly.
- Société de Géographie Commerciale* (1881) Bordeaux.
 Bulletin, fortnightly.
- Société Khédiviale de Géographie* (1881) Cairo.
 Bulletin, irregularly.
- Société Royale de Géographie d'Anvers* (1881) Antwerp.
 Bulletin, annually, in parts, irregularly.
- Verein für Erdkunde* (1882) Leipsic.
 Mittheilungen, annually.

OTHER EXCHANGES.

- Deutsche Touristen-Zeitung*, monthly (1883) Frankfort.
- Revue Géographique Internationale*, monthly (1876) Paris.
- The Scientific Roll*, irregularly (1882) London.

 Bibliography.

ANUARI DE LA ASSOCIACIÓ D'EXCURSIONS CATALANA. Any Primer,
 1881. Barcelona, en lo Local de la Associació.

THIS remarkable volume is calculated to excite our surprise and curiosity. Seeing the light in a country whose conditions we are accustomed to think of as less favorable to the fullest intellectual activity, and in a province of that land remote from the focus of capital and court, written in a language familiar to few save those who speak it, and incorrectly supposed by most others to be merely a dialect of the Spanish, the appearance of a volume of nearly six hundred octavo pages, representing a single year's activity of a society founded as recently as 1879, is of itself a matter of surprise. Add the fact that, in addition to those subjects usually looked for in alpine publications, it treats of a considerable range of cognate subjects, — scientific, archæological, literary and economic; that in workmanship it is elegant; that it is illustrated with not less than fifty plates, maps, and profiles, all exhibiting artistic merit, and chiefly from the pencils or cameras of members of the society, — and the book becomes hardly less than a phenomenon inviting to investigation and explanation. In an eloquent preface its reason for being is set forth, and with an enthusiasm so contagious that one finds already something of an answer to the query, how so much could be accomplished in so brief a time. An ardent patriotism, local and hence the more intense, has seized upon the alpine-club idea, wedded it to the zeal of modern science, and made the pair workers for fatherland. Accordingly not *alpinism* but *excursionism* represents the motive of this club, and this is defined as a cultus of fatherland and science. "The first aim of the association is to preserve and increase the Catalan spirit, persuaded that he who does this does a favor to Spain as a whole." "To call oneself a Catalan signifies not merely that one is the child of a land that has a name, language, history, and character of its own; but it is also to recognize the obligation to maintain oneself always worthy of a whole past of glory, the sacred legacy of illustrious predecessors." Hence

the Catalan is made the official language of the society, — a matter for which Philology should be grateful, though we may regret that so many are thereby debarred from enjoying its publications.

The means by which this patriotic spirit is to be fostered is through club excursions, — and the breadth of the field to be cultivated is very great. "Excursionism, impelled by love of country, awakens the spirit of investigation, stimulates the mind, signalizes objects for all kinds of study, and offers the broadest field to all tastes. Progress does not affright it; . . . but what progress is stable and in the right direction which does not found itself upon and refresh itself in the study of the past? Hence history and archaeology occupy so large a place in our work. . . . Are botany, geology, meteorology, topography, at such a pitch of advancement and development among us that they ask no aid of excursionism? . . . Are not the products of our land susceptible of improvement? Can we derive no more profitable results from our natural conditions? Have photography, painting, drawing, sufficiently revealed the beauty of our landscapes, the sternness of our mountains, the elegance of our monuments? Have we done what we could to render agreeable the visit of greater numbers to our land?"

If one were moved to prophesy failure by reason of a too ambitious programme, he has but to turn the leaves of the book to find that it is being literally carried out. The first four hundred and twenty-five pages are devoted to accounts of excursions, chiefly in Catalonia. These articles are profusely illustrated, and in a manner to awaken our ambition and emulation. Three poems follow, the one entitled "Amorra! Amorra," descriptive of a popular festival, a regatta, being exceedingly spirited and full of local color. Then comes a section of some seventy pages devoted to the sciences, arts, and literature, treating such themes as "Two newly discovered Roman Tablets," "Botanical Excursion to the Lower Ampudan," "The Coleoptera of Camprodon and its vicinity," "Lost Industries of Caspe," "Hypsobarometric Measurements in the Montseny," and other topics of interest. Lastly, there is an official section of fifty pages, containing the by-laws, history, list of corresponding societies, names of members, and other items of information with regard to the association. To increase our admiration for this most zealous society it remains to say it also publishes a monthly bulletin. C. E. F.

TERTIARY HISTORY OF THE GRAND CAÑON DISTRICT (with Atlas).
Captain C. E. Dutton, U. S. Geological Survey.

THIS monograph is the second in numerical order of a series to be published by the Survey, but is the first in order of issue. It includes a description of the region, written in a very interesting manner; a discussion of the great causes of the geological action which has taken place; and fine series of profiles, sections, sketches, and colored plates — some twenty-three in number — illustrating in an admirable manner the most striking features of the story. Discussion of the geological history of this district implies a consideration of the causes, progress, and results of erosion, and of this broad nature is Captain Dutton's report. When it is remembered that erosion is the supplement of deposition, — that process by which strata are accumulated, — an idea may be formed of the importance of its thorough consideration, viewed in the light of the most recent discoveries. The Grand Cañon of the Colorado River is situated at the northern boundary of Arizona, extending somewhat into Utah, and comprising an area of upwards of 13,000 square miles, across which the Colorado takes its course in a general southwesterly direction. For nearly 300 miles the river runs through a cañon varying in height from 1,000 to 6,000 feet, a region of extraordinary beauty and picturesqueness.

The Colorado originated probably in tertiary times, as the outlet of a great eocene lake. As the land rose, it gradually cut its way down through all the beds of the mesozoic and carboniferous systems to the archæan. The present Grand Cañon, however, represents only the lower formations, the upper strata which formerly covered the

district having been removed by erosion to a depth of several thousand feet of beds. Thus the river has accomplished a twofold work: it has cut out its own course, and it has carried to the ocean an immense amount of loose material, — the disintegrated upper strata of the surrounding country, brought down to it by innumerable little streams, permanent or intermittent, each of which has in its turn excavated its own cañon. The recession of cañon walls, the peculiar curves of the terraces, the character of the strata, and — from the more popular side — the picturesque and unique scenery are ably treated; and the reader can well agree with the author when he claims that it would be difficult to find anywhere in the world a region yielding more subject-matter for the consideration of the geologist than does the Grand Cañon district of Colorado. J. B.

HANDBUCH DES ALPINEN SPORT, von Julius Meurer, Präsident des Alpen-Club "Oesterreich," &c. A. Hartleben's Verlag, Wien, Pesth, und Leipzig.

As one of a series of manuals relating to the various exercises of man classed under the name of *sport*, appears this excellent work by the president of the Alpine Club "Austria." Not merely as a treatise, theoretical and practical, on the pleasures of what is known in Europe as *alpinism*, but also as a compendium of information with respect to the various Alpine societies of the world, it has a special value and interest. It is a book of more than three hundred pages, divided into five parts. The first contains a discussion of the term *sport* as used in connection with mountain climbing. The author here deprecates the attempt to characterize *alpinism* as a science, recognizing at the same time that it may and often does serve scientific ends. He regards it rather as one of the most legitimate and beneficial of the various methods whereby a cerebrally overtaxed race may find its refreshing and recuperative play. Part II. treats of the several ways in which frequenters of the mountains, the simple summer visitor in quest of relaxation (*Sommerfrischler*), the tourist, the pedestrian of moderate aims, up to the restless *hochalpinist* aspiring to the snow-clad peaks, may best find the satisfaction they come to seek. Part III. is a practical treatise on the costume and equipments necessary to comfort and safety, with a discussion of the provisions most approved for tours of some length. Next comes a very valuable section on the alpine districts of Europe, first dividing the Eastern and Western Alps into their subordinate natural groups, with mention of their peculiar attractions; then treating in detail the several principal centres in these regions, and what may be visited from them. This work is done with much minuteness and evident carefulness, the needs of each of the classes of visitors mentioned in Part II. being kept constantly in mind.

The remaining section, with its appendix, we found to possess an especial interest. Here the author has brought together in a succinct form many interesting facts concerning the leading alpine corporations and lesser associations with similar objects, such as the year of their establishment, field of activity, publications, number of members, fees. The Appalachian Mountain Club finds a place among the large corporations, not by reason of its number of members, but on account of their geographical distribution and the extended field of its activities. We note in the mention of our Club one inaccuracy. It is credited with being the first mountain club founded in America, where, it is claimed, the alpine spirit awakened much later than in Europe. This honor we cannot appropriate, for the Portland White Mountain Club, the Rocky Mountain Club, and the Alpine Club that formerly existed at Williamstown, Mass., antedate us. The last-mentioned society — though few in numbers and inspired by scenes of lesser grandeur to less ambitious deeds — dated from the year 1863, while the English Club, the prototype of all the others, was not founded until 1857. Hence America can hardly be said to have been far behind Europe in this matter. Adding the membership of the various societies, as given by Herr Meurer, it appears that not less than 50,000 persons were enrolled at the close of the year 1881! Finally, there

are appended the by-laws of the Alpine Club (London), the Alpine Club "Austria," the German and Austrian Alpine Club (with its 10,000 members in 80 sections), the Swiss, French, and Italian Alpine Clubs, and the Hungarian Carpathian Club. An elegant map of the Alps on a scale of 1 : 2,000,000 accompanies the manual. The price is 5 m. 40 pf. C. E. F.

Report of the Recording Secretary for 1882.

It is my pleasant duty to announce a continuance of the general prosperity which has characterized the last few years of the Club's history. The membership of the corporation has increased from 421 to 488, of whom 13 are life-members. The honorary and corresponding members now number respectively 9 and 35, making a total membership of 532. Among our corresponding members we note the death of General Gouverneur K. Warren of Washington, and the accession of Professor Archibald Geikie, of London, England, Professor Davidson of San Francisco, Professor Kerr of North Carolina, and Professor Maria Mitchell of Poughkeepsie.

Nine regular meetings of the Club have been held in Boston during the year, and a field-meeting at Jefferson, N. H. The Club has this year, for the first time, visited the State of Vermont; a party having ascended Mt. Ascutney in June, and the second field-meeting having been united with the Autumn excursion, in a trip to Manchester, Vt., during the last week of September. Excursions have been made to Breakheart Hill, in Saugus; to Newport, N. H., including a visit to Lake Sunapee and to Mt. Ascutney; and to Pack Monadnock, in Temple, N. H.; also, in connection with the field-meetings, to Mts. Adams and Madison, Starr King, Owl's Head, and Lake George. The party on Adams, numbering 28, and including many ladies, remained over night in the Appalachian camp, and was the largest party that ever enjoyed, in this way, the Club's hospitality.

About February 1 the experiment of a winter excursion to the White Mountains was tried, and quite a large party visited Jackson, N. H., and the White Mountain Notch. Being fa-

vored with good weather and excellent accommodation, the novel experience proved most enjoyable.

The annual reception was held in January, at the Hotel Vendome, and was fully as enjoyable as those of previous years.

With the view of putting all our publications on a better basis, the old printing committee has given way to a publishing committee, consisting of ten members. This committee is authorized to control the form, character, and times of issuing of all Club publications. One of the number is chosen Editor, and another, Business Manager of APPALACHIA. By this means the publication of our Journal can be carried on in a much more systematic and successful manner than has hitherto been possible. Vol. III. No. 1. has been issued, and No. 2. is expected soon to appear.

Some important changes in the By-laws have been made during the year. The clause requiring an annual address from the retiring president has been abolished, and the care of the library has been transferred from the Recording to the Corresponding Secretary. The most important one, however, is the change in the admission fee and annual assessment, from two to three dollars. It was felt that the Club was hampered in many of its most important activities by the lack of funds, and that members would not be paying too dearly, even at the increased rate, for the advantages which membership affords them. As APPALACHIA is to be sent free to members, for the present, there will be no increase in expense to those who have heretofore subscribed for the magazine.

Action has been taken by the Council, looking to increased care in regard to reporting our meetings in the daily papers, and also in regard to the admission of members to the Club.

We renew our thanks to the Massachusetts Institute of Technology for their hospitality in granting us the use of their rooms for our meetings, and also to the Boston Society of Natural History for the use of an alcove for our library.

The reports of the Corresponding Secretary, the Treasurer, and the Councillors will give accounts of our financial condition, and of the work done in the various departments during the year. In general, however, it may be said that the activi-

ties of the Club continue in successful operation, and that the appreciation of its usefulness, not only to members but to the community at large, is on the increase.

I desire to express my regret that a pressure of other duties renders it necessary for me to resign an office, the duties of which have been made a source of great pleasure to me during the last two years.

Respectfully submitted,

R. F. CURTIS, *Recording Secretary.*

Report of the Corresponding Secretary for 1882.

DURING the past year an important step has been taken, by amending Art. VI. of the By-laws, so as to make the care of the library of the Club a function of this office. Its importance is doubly great, as it bears upon the interests of the library itself, as well as upon the duties of the Corresponding Secretary. Hitherto, attached to an office which in other respects makes excessive demands upon the time and energy of its incumbent, the library has necessarily been subordinated to more immediate and pressing considerations. Add to this that, up to the present year, the books were not properly shelved, owing to the inadequacy of their place of deposit, that they were under lock and key, and seldom available, and it would not be strange if very few members of the Club knew of the existence of a library. The transfer of its custody to the Corresponding Secretary not only places it under the charge of an officer with fewer duties, but it may even be said that the change furnishes the only sufficient warrant for the continuance of this office, inasmuch as the small amount of official correspondence, outside of what relates more or less directly to the library, might be assumed by the Recording Secretary with but slight increase of his present labors.

At the same time with this change comes the removal of the books and pamphlets to the alcove kindly offered to the Club in its earliest days by the Society of Natural History.

Here they are being catalogued with the library of that Society, although upon cards of a special shape, and will, for the present, form an integral part of its library, equally available to members of the Society and of the Club. The maps and charts, of which the Club possesses a considerable collection, remain for the present in the cabinet in the Geological lecture-room of the Institute of Technology, under the immediate care of Professor Niles.

As the presentation of the letters received by the Club is now a part of the regular business of the monthly meetings, the annual report needs no more than summarize what has already been given in detail.

During the year the Club has received, from abroad, four invitations to participate in conventions and festivals, two communications upon topics of general interest to alpine societies, one acceptance of a proposal for interchange of publications, and one request for the same. The letters from American societies have also chiefly related to this last subject; and, as a result, the Club numbers six more exchanges than at the opening of the year, viz. the U. S. Geological Survey; the Geological and Natural History Survey of Canada; the Sezione di Vicenza, Club Alpino Italiano; the New Hampshire Historical Society; the Torrey Botanical Club; and the Scientific Roll.

The interests of the library have been the occasion of most of the letters written by the Corresponding Secretary. Late in the year some twenty were sent to various societies with which we are in correspondence, to obtain, by donation where possible, back numbers, or missing ones, of their publications, or at least data for a schedule of prices of such sets as our collection must have in order to become a good reference-library in this special department of literature. It is not yet time to receive responses to these requests; but meanwhile donations of money are invited from members and others interested in having such a library in Boston, for it is certain that, even with a very generous response from the foreign clubs, there will be occasion for an outlay of several hundred dollars in attaining this result.

At present the chief sources of increase are from the foreign

alpine and geographical societies, the U. S. Government, the State surveys, and occasional donations from individuals. The thanks of the Club are especially due to Colonel C. W. Folsom for numerous copies of the earlier geographical works published in this country, and to Lieutenant Frederick Schwatka, U. S. A., and Mr. W. H. Pickering. In accepting our proposal for exchange of publications, the New Hampshire Historical Society generously made the Club the recipient of several volumes of its Collections.

In view of the fact that comparatively few members will desire to avail themselves of the serial publications received from corresponding societies, I would here urge the advantages and feasibility of periodical clubs or circles, made up of those members who desire to see, regularly, one or more of them ; a plan of which the original idea was first suggested to me by our retiring President. Doubtless in each circle some person would be found willing to prepare abstracts of the contents of one or more periodicals ; and these, published in APPALACHIA under the head of Bibliography, could hardly fail to be of value and interest.

Respectfully submitted,

CHARLES E. FAY, *Corresponding Secretary.*

Treasurer's Report for 1882.

THE receipts for the year ending Dec. 31, 1882, were as follows :—

From balance on hand Dec. 31, 1881		\$330.32
“ admission fees of 128 new members	\$256.00	
“ assessments for 1882 from 264 members	528.00	
“ assessments for previous years	74.00	\$858.00
“ three payments for Life-Memberships, — from Messrs. J. B. Henck, Jr., and W. H. Pickering, and Miss Mary L. Vose		90.00
“ Appalachia, collection and sales		309.43
“ donation from Mr. A. M. Knapp		2.00
“ interest on cash loaned		22.07
		<u>1281.50</u>
		<u>\$1611.82</u>

The expenses were as follows:—

Paid for postage and stationery	\$143.59	
“ for printing and advertising	115.40	
“ for clerical services	34.50	
“ Appalachia, two numbers, and cost of collection made on same	675.93	
“ Suffolk Savings Bank for permanent fund	90.00	
“ towards expenses of delegate to Milan	25.00	
“ Department of Topography	25.40	\$1109.82
Balance of cash on hand		502.00
		<u>\$1611.82</u>

In addition to the above-mentioned cash balance on hand of \$502, the Club have on deposit at the Suffolk Savings Bank, Boston, the sum of \$360, being the total sums received from twelve life-members since the organization of the Club. All such receipts constitute a Permanent Fund, and, by vote of the Council, only the income thereon may be used towards current expenses.

Respectfully submitted,

CHARLES W. KENNARD, *Treasurer.*

TREASURER'S REPORT.

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STATEMENT OF RECEIPTS FOR FIRST SEVEN YEARS.

YEAR.	MEMBERSHIPS.					SALES OF APPALACHIA.			Interest.	Donations.	Life-Memberships.	Total.
	Admission Fees.	Yearly Assessments.	Back Assessments.	Advance Assessments.	Total.	By Sec'y and Treas.	By Publishers.	Total.				
1876	252.00	.....	.....	.....	252.00	24.00	19.00	43.00	.....	.....	.....	296.00
1877	52.00	248.00	12.00	.....	312.00	74.00	24.00	98.00	.....	.....	.....	410.00
1878	76.00	228.00	16.00	.....	318.00	48.00	28.00	76.00	.....	43.00	60.00	497.00
1879	148.00	290.00	40.00	.....	448.00	119.00	11.00	130.00	2.00	222.00	.....	802.00
1880	178.00	336.00	24.00	.....	538.00	106.00	11.00	117.00	11.00	86.00	90.00	842.00
1881	222.00	384.00	19.00	12.00	636.00	.....	.....	141.00	17.59	62.55	120.00	977.04
1882	255.00	528.00	74.00	.....	858.00	.....	.....	309.43	22.07	2.00	90.00	1281.50
Total	1184.00	1982.00	184.00	12.00	3862.00	.....	.....	914.43	52.66	415.55	360.00	5104.64

STATEMENT OF EXPENDITURES FOR FIRST SEVEN YEARS.

YEAR.	Permanent Fund.	Postage, Stationery, &c.	Miscellaneous Printing.	APPALACHIA.			Topographical Department.	Art Department.	Improvements & Exploration.	Clerical Expenses.	Field-Meeting Expenses.	Total.
				Printing.	Maps.	Total.						
1876	....	36.00	74.00	106.00	35.00	141.00	....	....	15.00	....	....	266.00
1877	....	39.00	84.00	115.00	40.00	155.00	....	13.00	....	....	....	500.00
1878	....	84.00	161.00	157.00	52.00	209.00	....	....	....	....	....	....
1879	60.00	66.00	96.00	165.00	35.00	200.00	2.00	53.00	20.00	....	....	520.00
				18.00	15.00	240.00	19.00	....	159.00	....	....	612.00
				171.00	8.00	....	....	....	....	....	....	....
1880	90.00	77.00	109.00	28.00	....	290.00	19.00	....	73.00	....	....	686.00
1881	120.00	199.22	194.87	241.00	49.00	246.23	37.95	....	2.00 ²	19.75	22.70	908.72
				236.23	10.00 ¹	....	....	....	66.00	....	....	....
1882	90.00	143.59	115.40	....	....	675.93	25.40	....	....	34.50	25.00 ³	1109.82
Total	360.00	644.81	834.27	.....	....	2157.16	103.35	66.00	335.00	54.25	47.70	4602.54

¹ Binding.

² Exploration.

³ Expense of Delegate to Milan.

Boston, Jan. 6, 1883.

This certifies that the undersigned have examined the accounts of Charles W. Kennard, Treasurer of the Appalachian Mountain Club, for the year 1882, and find them correctly kept and properly balanced, with satisfactory vouchers for all payments. The certificate of deposit in the Suffolk Savings Bank agrees with the statement of the account of the Permanent Fund. We find the assets of the Club to be as follows,

Permanent Fund in Suffolk Savings Bank, \$360.00
Cash in hands of Treasurer \$502.00

(signed)

EUGENE B. HAGAR, }
S. E. D. CURRIER, } Auditing Committee.

Reports of the Councillors for the Autumn of 1882.**Natural History.**

BY C. E. HAMLIN.

THREE communications have been received from members of the Club, relating to Natural History work, performed by them during the last summer. Named in the order of their receipt, they are : —

Notes upon the Flowering of Plants, observed at Randolph, N. H., from July 1, to Aug. 16, by Mrs. Lucia D. Pychowska of Hoboken, N. Y.

Notes on Plants found in Franconia Valley, and on Mts. Lafayette and Kinsman, made in July and August by Professor W. Whitman Bailey of Brown University, Providence, R. I.

Observations in regard to the Geology of Albert and Westmoreland Counties, New Brunswick, by Professor J. H. Huntington.

These papers have been drawn up with care, and contain facts and observations worthy of permanent preservation.

My own field work for the last season took the form of geological excursions, made in March and April, in the vicinity of Prague, Bohemia, at Karlstein, 18 English miles from Prague, and in the mining town of Pribram, 36 miles from the same city. May 3 and 4 were spent, in company with Dr. W. P. Manton of Boston, in making the circuit of the extinct craters and lava streams of the Alban Mountains, near Rome. May 10 and 11 were given to Vesuvius, and the 12th to exploring the extinct volcano of Monte Nuovo, near Naples.

**BOTANICAL NOTES MADE IN THE SUMMER OF 1882 AT RANDOLPH,
N. H. — BY LUCIA D. PYCHOWSKA.**

The spring of 1882 was an unusually late one, and hence, when the writer attempted to make use of the tables issued to accompany Mr. B. P. Mann's Catalogue, she could find no numbers, in the table for the month, corresponding to sundry plants actually in bloom.

Vaccinium Vitis Idæa was found July 1, blooming along the roadsides in Randolph. July 26, it was in flower above the tree-line on Mt. Adams. Aug. 16, it was still blooming in the Ice Gulch on the east side of Crescent Mountain, about 2,000 feet above sea-level. Sept. 27, our party found its berries formed in the Gulch, but hard and nearly green: evidently the frosts may nip them before they ripen. A pathetic figure of a life spent in conscientious endeavor, without prospect of ultimate success!

Ledum latifolium was nearly out of bloom on the floor of King's Ravine on the 20th of July. July 22, it was in full bloom on Mt. Madison, just above the tree-line; and Aug. 16, it was just coming into bloom in the Ice Gulch. Sept. 27 some blossoms were still found in that cool locality.

July 4, *Cypripedium Acaule*, white as well as pink, *Smilacina racemosa* and *bifolia*, *Clintonia borealis*, and the Mountain Ash, were all in blossom along the streams in Randolph.

Early in July, *Viola palustris* was blooming by the upper Salmacis Fall, Mt. Madison.

July 20, *Listera cordata* and *Habenaria obtusata* were in flower on Mt. Madison.

July 26, *Phyllodoce taxifolia*, *Kalmia glauca*, *Salix Cutleri*, *Arenaria Groenlandica*, and (lower down) *Goodyera repens* were all in bloom on Mt. Adams. Of *Loiseleuria procumbens*, one solitary blossom was found.

July 29, *Corallorhiza multiflora* — Mt. Madison.

July 31, *Solidago thyrsoides* — near the Appalachian camp, Mt. Adams.

Aug. 1, *Geum radiatum*, var. *Peckii*; *Nabalus nanus*; *Solidago Virgo-aurea*, var. *alpina*, — all on Mt. Adams.

Aug. 7, *Gnaphalium supinum*, *Oxyria digyna*, *Castilleja pallida*, *Salix argyrocarpa*, *Veronica alpina*, — Tuckerman's Ravine, all near the Snow Arch.

Aug. 16, *Pyrola secunda*, *Mitella nuda*, — Ice Gulch, Crescent Mountain.

NOTES ON THE PLANTS FOUND IN THE FRANCONIA VALLEY AND ON
MTS. LAFAYETTE AND KINSMAN, JULY AND AUGUST, 1882. —
BY W. W. BAILEY.

Clematis Virginiana, L. Very common in the lower valleys. August.

Anemone Virginiana, L. Sugar Hill. August.

Thalictrum Cornuti, L. Common in meadows, July; also found at the very summit of Mt. Lafayette, in the shelter of rocks. August.

Ranunculus recurvatus, Poir. Woods near Copper-mine Brook. In fruit. July.

Ranunculus acris, L. Fairly common. July.

Coptis trifolia, Salisb. In fruit. July-August.

Aquilegia vulgaris, L. Escaped in several places along the roads. July.

- Actæa rubra*. Bethlehem, Mt. Agassiz. July. In fruit.
Nuphar advena, Ait. Very common. July–August.
Dentaria diphylla, L. Several withered specimens found in August.
 Franconia.
Capsella Bursa-pastoris, Moench. August.
Viola rotundifolia, Michx. Very common in the woods about the base of Mts. Kinsman and Cannon. In fruit. July.
Viola blanda, Willd. In fruit. July.
Viola cuculata, Ait. In flower. July.
Drosera rotundifolia, L. Brook on Mt. Kinsman, in sphagnum, August 23. In fruit, also, near Copper-mine Brook at later date.
Hypericum perforatum, L. July.
Hypericum ellipticum, Hook. July. Common in meadows.
Hypericum mutilum, L. August. Common in meadows.
Elodea Virginica, Nutt. August.
Arenaria Groenlandica, Fenzl. Very abundant on summit of Mt. Lafayette, August 10; also brought me from summit of Moosilauke in July.
Tilia Americana, L. Near Copper-mine Brook; also banks of Ham Branch. August.
Oxalis Acetosella, L. Very common in mountain woods. July–August.
Impatiens fulva, Nutt. Franconia, Bethlehem. August.
Rhus glabra, L. Bethlehem. August. In fruit.
Ampelopsis quinquefolia, Michx. Only seen in cultivation.
Acer Pennsylvanicum, L.
Acer spicatum, Lam.
Acer saccharinum, Wang.
Trifolium pratense, L.
Trifolium repens, L.
Trifolium agrarium, L.
Vicia cracca, L. An escape. July.
Prunus Pennsylvanica, L. Fruit. August.
Spiræa salicifolia, L. July. In low meadows; also at the summit of Mt. Lafayette, August 10.
Spiræa tomentosa, L. A very troublesome pasture weed. August.
Agrimonia Eupatoria, L. Bethlehem. July.
Geum macrophyllum, Willd. Franconia Valley.
Geum radiatum, Michx. Var. *Peckii*, Gray. Very abundant, summit of Mt. Lafayette. August 10.
Potentilla Norvegica, L.
Potentilla Canadensis, L. Forming dense mats in pastures.
Potentilla tridentata, Ait. From Franconia Valley to summits of Bald Mountain, and Mt. Lafayette. Common. July–August, according to elevation.
Fragaria vesca, L.
Rubus triflorus, Rich. Fruit. July.

- Rubus strigosus*, Michx. Fruit. July.
Rubus villosus, Ait.
Pyrus Americana, D C. Fruit. August.
Amelanchier Canadensis, Torr. & Gray. Fruit. August.
Epilobium spicatum, Lam. Very common.
Epilobium coloratum, Muhl.
Oenothera biennis, L.
Oenothera pumila, L.
Circea alpina, L.
Ribes lacustre, Poir. Bridal Veil Falls. July, 1882. Fruit.
Ribes prostratum, L'Her. Mt. Lafayette. August 10. Fruit.
Sedum telephium, L. Along roadsides; not in flower.
Mitella nuda, L.
Tiarella cordifolia, L.
Hydrocotyle Americana, L.
Heracleum lanatum, Michx. Very conspicuous along roadsides. July.
 Franconia and Bethlehem.
Pastinaca sativa, L.
Cicuta bulbifera, L.
Osmorrhiza longistylis, Ds C.
Aralia hispida, Michx. Franconia Valley, knob on Mt. Kinsman, summit of Bald Mountain. July.
Aralia nudicaulis, L.
Cornus Canadensis, L. July 10.
Linnæa borealis, Gronov. July 10.
Lonicera ciliata, Muhl. July. In fruit.
Diervilla trifida, Moench. In valleys, and high up on mountains. July-August.
Sambucus Canadensis, L. August.
Sambucus pubens, Michx. In fruit. July. Very common and conspicuous.
Viburnum nudum, L.
Viburnum lantanoides, Michx.
Galium trifidum, L.
Mitchella repens, L.
Eupatorium purpureum, L.
Aster corymbosus, Ait.
Aster macrophyllus, L?. Not in flower.
Aster puniceus, L. August.
Aster acuminatus, Michx. Most common species in the mountains. August.
Erigeron Canadense, L.
Erigeron Philadelphicum, L.
Diplopappus (*Aster*) *umbellatus*, Torr. & Gray. High up on Mt. Agassiz and Mt. Kinsman. Late July-August.
Solidago bicolor, L. August.

- Solidago latifolia*, L. August.
Solidago Virga-aurea, L. var. *alpina*, Bigel. Summit of Mt. Lafayette. August 10. Abundant.
Solidago arguta, Ait. August.
Solidago nemoralis, Ait. August.
Solidago serotina, Ait. August.
Solidago lanceolata, L. August.
Rudbeckia hirta, L. July.
Bidens frondosa, L. August.
Maruta Cotula, D C. August.
Achillea millefolium, L. The commonest weed in meadows. July.
Leucanthemum vulgare, Lam. Infrequent. July.
Tanacetum vulgare, L. Around old houses. August.
Gnaphalium uliginosum, L. July.
Antennaria margaritacea, R. Br. August.
Senecio aureus, L. July. Varieties.
Cirsium pumilum, Spreng. July.
Cirsium arvense, Scop. July-August.
Lappa major, Gætnér. Bethlehem. Not common. July.
Hieracium scabrum, Michx. Roadsides. August.
Nabalus albus, Hook.
Nabalus nanus, D C. Summit of Mt. Lafayette. August 10. Abundant.
Taraxacum dens-leonis, Desf. July.
Lactuca Canadensis. Varieties. August.
Mulgedium leucophæum, D C. July.
Lobelia inflata, L. August.
Lobelia spicata, Lam. August.
Campanula rotundifolia, L.
Vaccinium Vitis-Idæa, L. Mt. Lafayette. August 10. In fruit.
Chiogenes hispidula, Torr. & Gray. Mt. Lafayette. August 10. In fruit.
Gaultheria procumbens, L. On road to Profile House. July.
Kalmia augustifolia, L. Mt. Lafayette. August 10. Bald Mountain. July.
Sedum latifolium, Ait. In fruit. Mt. Lafayette. August 10.
Loiseleuria procumbens, Desv. In fruit. Mt. Lafayette. August 10.
Pyrola secunda, L. July. Franconia.
Pyrola minor, L. July 31. In woods. Franconia.
Moneses uniflora, Gr. Franconia.
Chimaphila umbellata, Nutt. Franconia.
Monotropa uniflora, L. August.
Monotropa Hypopitys, L. August.
Plantago major, L. About houses; also on road up Mt. Agassiz. July.
Trientalis Americana, Pursh. July. Fruit.
Lysimachia stricta, Ait. July.
Epiphegus Virginiana, Bart. August.
Verbascum Thapsus, L. July.

- Chelone glaba*, L. July-August.
Melampyrum Americanum, Michx. July.
Verbena hastata, L. Sugar Hill. August.
Lycopus Virginicus, L.
Scutellaria galericulata, L. August.
Galeopsis Tetrahit, L. Very common. Called Burweed. August. Much frequented by bees.
Leonurus Cardiaca, L.
Diapensia Lapponica, L. In fruit. August 10. Summit of Mt. Lafayette.
Convolvulus sepium, L.
Apocynum androsaemifolium, L. Very common on roadsides. Bethlehem. July.
Asclepias Cornuti, Decaisne.
Frazinus Americana, L.
Phytolacca decandra, L.
Chenopodium album, L.
Polygonum incarnatum, Ell.
Polygonum hydropiper, L.
Polygonum aviculare, L.
Polygonum sagittatum, L.
Polygonum dumetorum, L.
Fagopyrum esculentum, Moench.
Rumex acetosella, L.
Ulmus Americana, L.
Urtica gracilis, Ait.
Pilea pumila, Gray.
Cannabis sativa, L.
Juglans nigra, L.
Fagus ferruginea, Ait.
Carpinus Americana, Michx.
Betula alba, var. *populifolia*, Spach.
Betula papyracea, Ait.
Betula lenta, L.
Betula excelsa, Ait.
Alnus incana, D C.
Alnus viridis, D C.
Salix Cutleri, Tuck. Summit of Mt. Lafayette. August 10.
Populus tremuloides, Michx.
Pinus Strobus, L.
Abies balsamea, Marshall.
Abies Canadensis, Michx.
Abies nigra, Poir.
Larix Americana, Michx.
Arisæma triphyllum, Torr.
Acorus Calamus, L.

- Typha latifolia*, L.
Habenaria orbiculata, Torr. July
Habenaria dilatata, Gray. July. Near Flume.
Habenaria fimbriata, R.Br. July.
Goodyera repens, R. Br. August.
Spiranthes gracilis, Bigelow. August.
Spiranthes cernua, Rich. August
Microstylis monophyllos, Lindl. July.
Corallorhiza multiflora, Nutt. July 10.
Cypripedium acaule, Ait. Flower. July.
Iris versicolor, L. July.
Sisyrinchium Bermudiana, L. July.
Trillium erectum, L.
Trillium erythrocarpum, Michx.
Medeola Virginica, L. July.
Maianthemum Canadense. Watson.
Clintonia borealis, Raf. July. Fruit.
Lilium Canadense, L. July.
Oakesia sessilifolia, Watson. Fruit. July.
Streptopus amplexifolius, D C. Fruit. July.
Streptopus roseus, Michx. Fruit. July.
Veratrum viride, Ait. From the valleys, high up the mountains, as on Mt. Lafayette to over 4,000 feet; there apparently sterile.
Luzula arcuata, Meyer. Mt. Lafayette. August 10.
Juncus trifidus, L. Mt. Lafayette.
Scirpus caespitosus, L. Mt. Lafayette. August 10.
Carex scirpoidea, Michx. Mt. Lafayette. August 10.
Carex rigida, Good. Mt. Lafayette. August 10.
Carex crinita, Lam. Franconia. July.
Carex scabrata, Schw. The Flume. July.
Carex vulpinoidea, Michx.
Phleum pratense, L. July.
Agrostis scabra, Willd. July.
Agrostis canina, L., var. *alpina*, Oakes. Mt. Lafayette. August 10.
Calamagrostis Canadensis, Beauv. July.
Glyceria Canadensis, Trin.
Glyceria aquatica, Smith. July.
Poa annua, L.
Bromus ciliatus, L.
Triticum repens, L.
Poa laxa, Hænke.
Danthonia spicata, Beauv.
Hierochloa borealis, Roem. & Sch.
Panicum capillare, L.
Panicum depauperatum, Muhl.
Panicum Crus-Galli, L.

- Setaria glauca*, Beauv.
Polypodium vulgare, L. Near Bridal Veil Falls. August.
Phegopteris polypodioides, Fée.
Phegopteris Dryopteris, Fée.
Pteris aquilina, L.
Adiantum pedatum, L. A few scattered patches near Mt. Jackson House, Franconia.
Asplenium filix-foemina, R. Br.
Dicksonia pilosiuscula, Willd.
Aspidium Noveboracense, Swartz.
Aspidium spinulosum, Swartz.
Aspidium cristatum, Swartz.
Aspidium acrostichoides, Swartz.
Onoclea sensibilis, L.
Osmunda Claytoniana, L.
Osmunda cinnamomea, L.
Botrychium ternatum, var. *lunarioides*, Milde.
Lycopodium Selago, L. Mt. Lafayette. August 10.
Lycopodium annotinum, L.
Lycopodium clavatum, L.
Lycopodium dendroideum, Michx.

To these could be added a very extensive list of mosses, which I have not as yet determined. Many of the foregoing plants were preserved. My habit was to note every recognizable plant in my walks and drives. Unless otherwise stated, the plants are from Franconia Valley.

SOME OBSERVATIONS IN REGARD TO THE GEOLOGY OF ALBERT AND WESTMORELAND COUNTIES, NEW BRUNSWICK.—BY J. H. HUNTINGTON.

THE Bay of Fundy at its eastern extremity has two long arms. The southern arm stretches more than eighty miles due east, from where Chignecto Cape projects into the bay and divides the tidal waves, which flow with ever increasing height and force as they approach the gradually contracting shores. To this arm of the bay many pilgrimages have been made by students in mineralogy, to collect the beautiful zoolites that are found in the great dikes that have been erupted along its shores. The northern arm extends north and northeast, and is itself divided by a neck of land which ends at Cape Marenguin. On the east of this neck is Cumberland Basin, and this, with its connecting waters, nearly separates Nova Scotia from the rest of the Provinces. On the west of the neck is Shepody Bay, which at full tide is from six to eight miles wide. There are two rivers that flow into this bay: one, the Memramcook, comes directly from the north; the other, the Petitcodiac, comes from the north-

west and west, while one of its branches rises far south, near the Bay of Fundy, and runs nearly north. This, with the Petitcodiac and the bays, make Albert County almost an island. Westmoreland County lies mostly between the Petitcodiac River and Northumberland Straits; hence it is largely surrounded by water. These two counties form the extreme south-east portion of New Brunswick. In all the northeast part of Albert County, and in most of Westmoreland, the rocks belong to the Lower Carboniferous formation, and consist of conglomerates, sandstones, and shales. Albert County is famous for its great beds of gypsum, which are found near Hillsboro, and from it the finest calcined plaster is made. Not far from here, and near Albert Station, we find that peculiar form of asphaltum called Albertite. Although the old mines are exhausted, prospecting is being carried on, with the expectation of finding other veins. Manganese of the finest quality has been produced in great quantities at Hopewell, and is not yet exhausted. On the west side of Shepody Bay, between Albert and Hopewell, there are extensive quarries of olive-brown sandstone, and near these is Shepody Mountain. This mountain is of considerable interest from the fact that it is composed of a greenish argillite; and, on account of the lithological character of the rocks, it has been regarded as an island of the Huronian formation, entirely surrounded by the Lower Carboniferous; and, as such, it presents an inviting field for study. Grindstone Island, near the outlet of Shepody Bay, has quarries that produce both building stone and grindstones. The most famous quarries are at Rockport and Joggins, on the neck of land between Shepody Bay and Cumberland Basin. Northwest of these quarries, and on the other side of this neck of land, and also farther north on the line of Dorchester and Sackville parishes, the sandstone contains chalcocite, or copper glance, as segregated impregnation; and the coal, scattered through the sandstone, forms the matrix of the larger masses of the ore.

If these ore-deposits are worked, of which there seems to be a prospect now, they will present a fine opportunity for study, to determine the character of the pebbles which compose the sandstone, and to find out whence they were derived; and, knowing this, the probable origin of the copper, or the source whence it was derived, could be determined.

Reports of the Councillors for the Autumn of 1882.**Topography.**

BY J. RAYNER EDMANDS.

MT. WASHINGTON was occupied during part of the past summer by General R. D. Cutts, of the U. S. Coast and Geodetic Survey, to take observations in the primary triangulation. Professors E. T. Quimby and D. C. Barbour, of the same Survey, observed for the secondary triangulation, in southern New Hampshire and southern Vermont respectively.

The writer's observations were taken in Canada, upon Mts. Orford, Owl's Head, and Belœil in the Eastern Townships and on Mt. Royal. Fortunately Professor C. H. McLeod, of Magill College, intended to make a survey connecting the U. S. Coast Survey station in Mt. Royal Park with the Astronomical Observatory of Magill University; and he kindly offered to include in his survey any intermediate point which the writer might find it desirable to occupy. The observations are part of a scheme involving more than one season's work, and therefore no fragmentary results of the first season are given.

A small geodesic circle, belonging to the Massachusetts Institute of Technology, and pronounced worthless on account of defective method of mounting the telescope, was found to be otherwise good, and well adapted to our observations. Permission was therefore obtained to have it altered, at the expense of the Club, and to use it on the expedition to Canada. It proved quite serviceable. The trunions of the new transverse axis, fixed upon the telescope, rest in Y's upon the top of a U-shaped piece, carried by that part of the instrument which rotates about its vertical axis. One side of the foot of the U rests upon a wedge, for adjusting the transverse axis normal to the vertical axis. As the uprights of the U are short, the telescope is lifted for reversing. The spirit-level is fixed to the telescope (but adjustable) parallel to the transverse axis. This is an unusual disposition of it; and the

only one — except the inconvenient expedient of carrying a third separate piece into the field — by which a single level serves all purposes for which a level is needed. This arrangement is also well adapted for teaching the theory of the manipulation of the geodesic transit; since every possible method of reversing facilitates some adjustment or elimination of instrumental error, while each desired adjustment or elimination, excepting inequality of pivots, has its corresponding method of reversal.¹ The graduations, however, are not fine enough for practice in acquiring precision, but are rather adapted to the medium accuracy aimed at in our operations.

Mr. W. H. Pickering's little book and map² will prove a valuable aid to further work on the topography of the Presidential Range. Although he has refrained to a commendable degree from experimental changes in nomenclature, he has unfortunately attempted to restrict the term Great Range (why not drop the name?) to its northern spur, and to substitute generally the word *range* for *ridge* or *spur*. Mt. Wachusett is omitted from his list of distant points visible from Mt. Washington.³

Miss M. M. Pychowska has contributed useful notes on the topography of the northern slopes of Mts. Madison and Adams. The department needs more of this kind of work from members who may not care to use instruments of precision. Professor F. D. Allen used the plane table in the vicinity of Shelburne. His scheme of work was not completed in the one season. Mr. E. G. Chamberlain has completed his work on the Blue Hill region near Boston.

Late in the season the writer visited Professor Quimby's party on Blue Job Mountain, N. H., and drew profiles with the topographical camera.

¹ For example, suppose we wish to ascertain whether the transverse axis is normal to the main axis, without assuming that the latter is precisely vertical. Lift the telescope without turning it over, give the parts carrying the U a half revolution, and replace the telescope in the Y's. If the adjustment in question be perfect, the bubble will return to the same reading as before, whatever that may have been.

² Guide to the Mt. Washington Range. Boston: A. Williams & Co. See also APPALACHIA, Vol. III. p. 54.

³ APPALACHIA, Vol. II. p. 365.

Reports of the Councillors for the Autumn of 1882.**Exploration.**

BY W. H. PICKERING.

DURING the past summer several interesting expeditions have been undertaken. Outside of the White Mountains proper, an ascent was made of Mt. Orford, in the Province of Quebec, and some explorations accomplished in the Maine woods, north-east of Katahdin. Within the White Mountain region the most notable was that made by a party which traversed the hitherto almost unknown Twin Range.¹ The two remaining expeditions of note were made by Messrs. R. Spaulding and H. Dike, up the valley of the Wild River, lying east of the Carter Range; and, later, up the East Branch of the Pemigewasset, *via* the Franconia Branch to the summit of Mt. Lafayette, and thence to the Profile House.² On the Great Range a new spring has been discovered by Rev. William McGinley, of Portsmouth, N. H. It lies south of Spaulding's Spring, on the slope leading to the Great Gulf, and is represented to be one of the finest springs in the mountains.

In the course of the past three years, during which time the "Table of Less-visited Peaks" has been published, forty-seven mountain names have appeared on the lists. In 1876, at the time of the founding of the Club, there were no published accounts of any of these summits; many of them were wholly unexplored, and several even unnamed. Of these there now remain but thirteen, of which no description has, as yet, appeared in APPALACHIA. It is hoped that during the term of my successor the list may be still further abridged, if not extinguished; so that ere long there may be no important White Mountain summit, of which an account cannot be obtained through the medium of our Club.

Below is continued the list of prominent, but comparatively unknown, White Mountain summits, in regard to which infor-

¹ See p. 107.² See p. 180.

mation is still desired; together with the names of those, of which accounts appear in the present number of APPALACHIA.

TABLE OF THE LESS-VISITED PEAKS OF THE WHITE MOUNTAINS (*continued*).

No.	Name	Elevation in feet.	Reference.
1.	Shelburne Moriah (Bald) .	4,400	
2.	Imp	4,000	
3.	Carter	4,700	
4.	Wildcat	4,350	
5.	Royce	2,600	
6.	Parker	3,300	
7.	Field	4,400	Appalachia, III. p. 121.
8.	Nancy	3,800	
9.	Twin, North	5,000	Appalachia, III. p. 111.
10.	Twin, South	5,000	Appalachia, III. p. 113.
11.	Hale	3,400	
12.	Huntington	3,800	
13.	Garfield	4,500	
14.	Blue Ridge	3,300	
15.	Waternomee	3,000	
16.	Cushman	3,300	

WILD RIVER VALLEY AND THE REGION OF THE EAST BRANCH OF THE PEMIGEWASSET. BY RANDALL SPAULDING.

WE entered the Wild River valley at Gilead, and after camping three nights arrived in Jackson. The valley was evidently invaded by lumbermen many years ago. The remains of an old dam are still seen some eight or ten miles from Gilead. In its extreme upper part the course of the main stream turns sharply to the north. In following it, we come to a sort of lake about thirty rods in length and averaging from three to four rods in width, lying almost exactly south from Carter Dome. This is fed by small streams that rise still farther to the north. Directing our course nearly northward from this point, we came upon a wood-path that is said to extend far down into the valley. The path from this point to Davis's seemed interminably long. We saw many deer-tracks in the valley, and occasionally partridges and squirrels. This valley, especially in the upper part, has a wild and desolate appearance that made our tramp decidedly interesting. Very little of the mountains is seen by one following the course of the stream.

If the map is correct we can scarcely have come through Perkins's Notch; yet, as seen from Davis's place, we seemed to have come through the only notch that exists.

On the following day, Friday, we passed around to the Willey House, and at eight o'clock, Saturday morning, started for the Pemigewassett Wilderness. We first climbed to the top of Willey to take a good look at the region, and get our bearings. From the top we descended northwest along the slope of the northern part of Willey, until by climbing a small tree we got an excellent view of Field, and of the open swamp in which the East Branch rises. We went directly to this spot and began descending the stream. We soon came to the cascades to which Mr. A. E. Scott referred at the Jefferson field-meeting. I need hardly say that we were delighted. Upon a huge boulder in the middle of the stream at the bottom of the long cascade we built a cairn. From this point the upward view extends some fifty or sixty rods, and is certainly unique. The broken stumps and pointed evergreens that stand against the sky, and the long channel of white rock down which the stream slides so easily and musically, make a picture that I cannot forget. Two such spots of picturesque beauty as this and Thoreau Falls should in some way be made accessible to summer tourists. If a trail were marked the entire distance, it would seem to me no more than a single day's tramp to climb Willey, visit these two falls, and return by way of Ethan's Pond. Better yet if a camp should be built near the junction with the Ethan's Pond Brook.

We found the camp that Mr. Scott's party had built a little below this brook. The record-bottle, with the names inscribed, was in good condition, and we added our own names.

At the Forks we saw nothing of the camp that we expected to find; but at this point, or soon after, we came upon a path on the left bank that we followed to the Franconia Branch. We camped about a mile and a half up the branch. The next morning, almost immediately after starting, we came to what we supposed to be only a dividing of the stream. We kept on to the right, but were unable afterward to find any beginning of this divide. After a while we came to a stream that flowed in on the right; but its course was so nearly parallel with the main stream, and it had so little flood-ground of its own, that we felt sure that it was only a divide and so followed the main stream to the left. We found nothing of its beginning afterward. We found another brook coming in on the right, that, judging by the map, was far too small to be Red Rock Brook. We soon knew by the summit of Garfield that we were still on the Franconia Branch, and determined to follow it up.

It is doubtless an old story with some, but the scenery in the vicinity of the upper fork of this branch impressed me as wonderful. It would interest sportsmen to know that, as camping-time drew near, we sat down beside a large pool, and in a few minutes took out thirty good-sized trout. We camped at this upper fork, and in the morning followed the left-hand stream for perhaps a mile and a half; then went straight to the top of Lafayette, whence we descended by the path to the Profile House. I was disappointed in not finding the Red Rock Brook which I had in-

tended to follow, but the way we took was doubtless more interesting to us, as we had never before been at the top of Lafayette.

I should report that in the ascent of Lafayette we were obliged to pass through a considerable belt of scrub spruce. I do not see how the upper fork of Franconia Branch can be easily made accessible from any hotel. Judging by the appearance from Lafayette, it seems to me that the State map is altogether wrong. It seems impossible for any stream so large as the Red Rock is represented on the map, to enter the main branch so far to the south.

MT. ORFORD. BY J. RAYNER EDMANDS.

THIS mountain, the highest in the Eastern Townships of the Province of Quebec, or possibly the second in height, is ascended from a point seven miles (or an hour-and-a-half ride) west from Magog, on the road to Waterloo. Magog is at the foot, or northern end, of Lake Memphremagog, and at the eastern terminus of the Waterloo & Magog Railroad. The railroad furnishes connection with Montreal by a train once a day each way. A steamer on the lake furnishes connection with the Passumpsic Railroad and the South Eastern Railway at Newport, Vermont. There is ground for hope that this steamer will in future make trips at the advertised times.

Leave the road near the fork, between Mrs. Bowen's house and the lake. It is perhaps two miles more to Amber Brook station on the railroad, where there is said to be an inn; but the writer has not been there. Coming from Magog, take the right-hand road at the fork; but leave it after a few rods and find the path on the right, having learned particulars at Magog or Mrs. Bowen's. Timely information, efficient guidance, and pleasant companionship were given the writer by the Rev. Mr. Hepburn and Mr. Ralph Moore of Magog, who enjoy the woods and mountains, and seem to take pleasure in assisting others.

The foot-path from the road to the summit is perhaps two miles long, — first through woods and then among low growths, — is moderately steep, and is somewhat overgrown. No difficulty, however, will be found by one experienced in following such paths. An active climber can ascend in an hour.

There is no growth left on the summit sufficient to obstruct the view for one able to shift his position a few metres. The White Mountains are seen in the southeast and the Green Mountains in the south. With the exception of the northerly extension of the latter range, the nearer mountains with which Orford is surrounded are more separated from each other than in New Hampshire. The writer hopes to give further attention to their identification and location. Lake Memphremagog, stretching for over twenty miles southward, and the little Orford Lake at the very foot of the mountain, are pleasant features in the view.

Reports of the Councillors for the Autumn of 1882.

Improvements.

By A. E. SCOTT.

THE department of Improvements, as in former years, has found sufficient work to do, with very slight resources to draw upon beyond its own energies. Very little assistance is rendered by individual members, and the Council is not lavish in its appropriation. The Club is known to the public largely through this department; much of the enjoyment of its members and many others, during the summer months, is due to its work, and we ask for our successor a more generous support.

The department is always embarrassed by the difficulty of procuring faithful workmen to do forest or mountain work, and some of the paths have been neglected during the year for this reason. Early in July the Mt. Adams and King's Ravine paths were put in good condition, for use at the time of the field-meeting at Jefferson. The old camp on Mt. Adams was also repaired, and a new camp constructed near to and at right-angles with the old one. The new camp is twenty feet long, tasteful in design, and less liable to be filled with smoke from the camp-fires. Its capacity and convenience were fully tested by the large camping party on one of the excursions taken in connection with the field-meeting.

The distance from the summit of Mt. Washington to Tuckerman's Ravine, by the route marked last year by Messrs. Burt and Whitney, has been measured, and every hundredth metre the distance has been painted on the rocks. Other distances have been measured by them with the following result:—

From the Summit to the foot of the Snow Arch	1,320 metres.
“ the Snow Arch to Hermit Lake	1,250 “
“ Hermit Lake to the junction of the A. M. C. Path with the Raymond Path	425 “
“ the junction of the paths to the Glen House carriage- road	3,560 “
Total	6,555 “
	or about $4\frac{1}{2}$ miles.

The distance from the beginning of the Raymond Path to the Glen House is about $1\frac{3}{4}$ miles, making the whole distance from the summit to the Glen House, through the Ravine, about $5\frac{7}{8}$ miles. A large sign has been prepared by the department, giving these distances, which is to be placed at the beginning of the path, near the Summit House; and smaller signs, pointing to the summit, are to be placed on the head-wall of the Ravine. Some work has also been done on the route which it is proposed to mark from Washington to Madison.

We are pleased to record the construction of new paths to the summits of Madison and Adams, by Mr. Laban M. Watson of Randolph. The paths start as one from a clearing opposite the Ravine House, and follow Snyder Brook, *via* the beautiful Salmacis Falls, nearly to the head of the Ravine. At $2\frac{5}{8}$ miles from the Ravine House they diverge, the Madison Path turning to the left, crossing the stream, and ascending the steep wall of the Ravine to the bare ledges; while the Mt. Adams Path, bearing to the right, ascends the opposite wall. These paths are described in detail by Miss M. M. Pychowska, in a paper appended to this report.

An exploration was made by this department, in August last, over the Twin Mountain Range, from the Ammonoosuc to the East Branch of the Pemigewasset, and thence, *via* Thoreau Falls and the cascades referred to at the Jefferson meeting, over Mt. Field, to the head waters of the Saco. The exploration lasted seven days — the party being four days surmounting the difficulties of the Twin Mountain Range.¹ One of the objects of the exploration was to determine the feasibility of a path over the ridge, or to some of its summits, and to mark the route. The party returned full of enthusiasm over the wonderful views afforded from these mountains, and the beauty of the whole region; and the councillor of this department renewed his determination to accomplish some part of the proposed work before the season ended.

The fund for this project, subscribed last year, was at last generously increased by the proprietors of the Twin Mountain House, and we were thus enabled to contract for the construction of a path to the summit of the North Twin, and thence,

¹ See p. 107.

over the ridge, as far as the summit of the South Twin. At the expense of considerable time, and after many annoyances, the work has been completed to the summit of the North Twin. Snow and the extreme cold at that altitude drove the workmen from the mountains in October; but the path will be cut through the scrub to the south summit in June of next year.

A permanent camp has been constructed on one of the small streams, so high up that we are sure the water will not fail in a dry season. This camp, built of logs, is open in front, twenty feet long and ten feet deep, thus affording shelter for a large party.

The route, starting from the Twin Mountain House, crosses the Ammonoosuc by the highway leading to the clearings on the west side of the river, and turns into the forest by a logging road about $1\frac{1}{2}$ miles from the hotel. It continues by this road about $1\frac{1}{2}$ miles to Little River, opposite a place known as Tarbell's Camp; crossing the river at this point, it follows up by another logging road, and past Day's Camp, for about one mile. At this point our path begins, and runs parallel with Little River until it reaches the stream which flows into it at the foot of the cascades, known as the Falls of the Little River. It crosses this stream, and gradually ascends the shoulder which leads to the summit. The length of our path is from 4 to 5 miles; and the whole distance from the Twin Mountain House is probably over 8 miles. The distance on the ridge, from the north to the south peak, is probably about one mile.

The north summit is not entirely clear, and a view in all directions cannot be obtained from any single point; but on the south summit there is a large area of bare ledges, affording an unobstructed view which we will not attempt to describe; but fine as this view is, we think it is equalled, if not surpassed, by the views from the summits of Guyot, and especially from the cliffs that jut out into the great Pemigewasset forest, southwesterly from Mt. Bond, and we shall not rest content until the path is extended to this point. We ask the privilege of seeing that the work contracted for to the south summit is completed, and that the route is marked by the signs now being prepared; and we volunteer to push the work to the

weather. Cold Brook, of course, is unrivalled. On August 3 our thermometer stood at 40° when plunged into the water of the upper west branch, and, the operation being repeated at the foot of Moss Cascade on the main stream, it very nearly touched 34°, while a chill white vapor rose off the water. This same warm August day, on which the shaded instrument read 72° on the top of Mt. Madison, it went down to 50° in an open area among the ice-sheltering bowlders of King's Ravine. Even in the valley, the famous spring near the Ravine House has, ordinarily, a temperature of 40°.

AMMONOOSUC LAKE.

[Extracts from a letter of MR. C. B. RAYMOND to the Councillor of Improvements.]

YOUR esteemed favor, giving valuable intelligence concerning the Cascades of one of the streams on the westerly slope of Mt. Field, which you have brought into public notice, has been most carefully noted by me.

I received your letter just after I had volunteered to direct the making of a path from the Crawford House through the woodlands, north-westerly from the house, to a valuable spring of pure, perennial, and very cold water, which flows in full volume from rocks in the slope of a most beautifully woodclad dell, northwesterly, and a long quarter of a mile only from the house. The waters ripple joyfully away from the spring about two rods into the lake below. The spring is connected with the lake, at its southwest corner, by a path which ends on a nice wharf with seats, boats, and fixtures for the comfort and pleasure of visitors.

The spring was formally dedicated by the guests of the Crawford House with an appropriate address by Rev. D. L. Furber, D.D., of Newton Centre, Mass., Aug. 24, 1882, and named the Merrill Spring. The path to it is a continuous arbor pleasantly bordered with shrubbery, ferns, and mosses; and this ramble, with the spring, and the pre-eminently beautiful lake at its end, has become a very great resort for guests of all ages at the Crawford House.

The lake is about three times as large as the Saco Lake in front of the house, when the Saco Lake is full. It is of deep, pure, spring water with a large, leaping outlet, one of the gems of the mountains, and is set in a symmetrical contour, rising from twenty to thirty feet above the water, woodclad with hard and soft timber and shrubbery. The scenery from its centre is wonderfully beautiful, and it gives pleasure to every one who visits it. It is a great trout lake with a rocky bottom.

Among other things I undertook to restore this lake to its pristine beauty, clear out the knots of tangled dead trees, limbs, and rubbish along its shore, much of it under water, — whole trees almost as hard and heavy as iron, — a desperate undertaking. But a great mass of it has been fished out and piled up to be hauled off, although the lower (south-

east) corner and end require much still to be done. But the men worked well, for they got large returns in the beauty developed by taking out the dead wood. The lake is altogether changed, and is being visited by hundreds of gentlemen and ladies.

This lake, locally known as the Pond, is one of the head-waters of the Ammonoosuc River, and its owner has named it the Ammonoosuc Lake, by which name it will hereafter be known in its vicinity. The name is geographically appropriate and descriptive. It will place the Crawford House in its true geographical position, on the divide between Saco Lake and Ammonoosuc Lake, both of which, as you know, are near the house.

I have stated all these matters for two reasons, to show that I have been constantly occupied, — the reason I have deferred writing you so long in reply to your valuable letter as to the Cascades, — and also because I think that you fully appreciate the value of every new attraction developed in the mountain region, however small it may be.

I appointed with a friend three separate times, and once had my lunch all prepared, ready to start early on the following morning for the Cascades. In each instance I was prevented by circumstances beyond my control, — a disappointment which I have greatly regretted. The last time my friend thought it best to defer our visit until next season; and, as I was about leaving the Crawford House, I was compelled to defer it. The water, too, was very low. Your description of these Cascades has given me a strong desire to see them, which I shall do surely next season, if I am at the Crawford House in my usual health.

I think very important means may be obtained next season at the Crawford House to make a path thence to the Cascades, and that we there can make the path; and let the Appalachians put their money, which they would spend for this purpose, upon some other important development in some other district, which will be a clear gain. Later, perhaps, a path to Thoreau's Falls, which I have often thought of, may be extended by people at the Crawford House in the same way, without the Appalachians taking any trouble or expense about it; which also will enable the latter to continue their excellent work of developments in other sections of the mountains. But, of course, I will not promise funds for a path to the Cascades, or money to pay for it, until I have learned next season that it can be done by my friends.

A PATH FOR HUNTINGTON'S RAVINE. BY RANDALL SPAULDING.

To one who has had any experience in the White Mountain woods, the walk from the Raymond Path to the foot of the head-wall cannot be formidable. Standing upon one of the great boulders in the bottom of the ravine, one seems to be in the midst of an immense bowl. The height and precipitous character of the walls conspire to make this view

peculiar and impressive, — inferior, in my opinion, to no ravine scenery in the mountains with the possible exception of that in Tuckerman's. The ascent of the wall is not remarkably difficult if the right way be selected. We tried at first to ascend too near Huntington's Cascade, and were at length forced to return some distance. It was an experience that I should prefer not to repeat. By keeping to the scrub on the right, the top may be reached with very little risk. Would not the Club do a favor to many lovers of mountain scenery by cutting a trail from the Raymond Path to the foot of the wall, and by marking clearly a practical course up the wall near Huntington's Cascade?

I will add that any one will find a safe and comparatively easy way of descent, from a cairn built entirely of quartz rock.

Other members of the Club can judge, better than I, whether a considerable number would be likely to choose the Huntington Ravine route in walking from the Glen House to the summit of Mt. Washington.

Proceedings of the Club.

June 14, 1882. — Fortieth Corporate Meeting.

Held at the Waumbek House, Jefferson N. H.

President Niles in the chair.

The President alluded to the loss which the Club had sustained in the death of Professor W. B. Rogers, "the most honored member of the Society, and one whose name would have graced the roll of the best or highest similar organization. He was one who shrank from mere honor, but was always ready to do his part in any work."

Professor Fay, for the committee on nomination of President, announced the name of Professor Edward C. Pickering as their candidate. On balloting, this gentleman was unanimously elected and was called to the chair.

Ten candidates for membership and four for corresponding membership were nominated, and those presented at the last meeting were all elected.

The Corresponding Secretary referred to the letters received during the month, and presented the circular of the approaching meeting of the International Alpine Congress at Salzburg.

The excursion of the Portland White Mountain Club, to be held on the 15th inst., was mentioned, and it was voted that a message of good wishes be sent to them.

The Councillor of Topography made a report, and showed how persons with but little practice could give valuable assistance in his department.

The Councillor on Improvements made a report, suggesting the carrying out of previously laid plans and the making of necessary paths.

A paper, by Mr. John Tatlock, Jr., of Williamstown, was read, entitled "Variations of Barometer Measurements of Altitude with the Season" (see p. 147), and remarks by several members followed.

A paper was also read, entitled "To Roan Mountain," by Professor J. W. Chickering of Washington, D. C. (See p. 142.)

The proposed amendments to the Constitution (see p. 85) were then considered. Amendments II. and III. were adopted. Action on I. and IV. was postponed.

July 18, 1882. — Fourteenth Field Meeting.

President E. C. Pickering in the chair.

The President made a brief address, noting the objects of the Club, and commenting on the work done in various departments.

Announcements were made by Professor Fay of proposed excursions to Starr King Mountain, Mt. Adams, King's Ravine, &c.; also of various railroad excursions to Lake Memphremagog, the Profile House, Plymouth, and Mt. Washington.

Mr. Scott read an account of an exploring party up the East Branch of the Pemigewasset, and suggested an excursion to the Forks on that stream.

Professor S. P. Langley gave an account of his work on Mt. Whitney in California, under Government auspices; with interesting facts relating to the geography, topography, and physics of the region, and an account of the ascent of the mountain, to the Camp, at an altitude of 13,000 feet.

Professor Fay called attention anew to the approaching International Congress to be held at Salzburg,—under the auspices of the Deutscher und Oesterreichischer Alpenverein,—presented a programme of the various subjects to be considered, and moved the appointment of a delegate. Mr. W. H. Pickering was then elected to represent this Club at the Congress.

A vote of thanks was tendered to Mr. Laban M. Watson, for constructing a path from the Ravine House, in Randolph, to the summit of Mt. Madison.

July 17, a party of seven made the excursion by rail to the summit of Mt. Washington.

July 18, the ascent of Starr King was made.

July 19, a party of fifty made an excursion to Mr. C. E. Lowe's house, at the entrance to the Mt. Adams path. Twenty-eight made the ascent to the camp, and remained over night. Twenty-four ascended to the

summit the following morning, being under charge of Mr. Scott. From this point, twenty crossed to the summit of Madison, descending to the Ravine House over the new path cut by Mr. L. M. Watson, while four descended the head-wall into King's Ravine. This party here met a party of four, under Mr. Ritchie, who had descended from the camp and ascended to the floor of the ravine, another party of eight from the neighboring hotels, nearly all members of the Club, and a third party of twenty who, under Professor Pickering, had left the Waumbek House the same morning, coming directly to the ravine. Two of the company, Messrs. Spaulding and Dike, returned to the camp, spending the night there, and reaching the summit of Mt. Washington, over the range, the following day. The others returned to Jefferson in the evening.

A party of five made the excursion through the Franconia Notch on the following day, Friday, reaching Plymouth by stage on Saturday at noon.

A party of fifty made the ascent of Owl's Head, three of whom visited the main summit of Cherry Mountain.

October 11, 1882. — Forty-first Corporate Meeting.

President Pickering in the chair.

Thirty-two candidates for membership were nominated, and those presented at the last meeting were all elected. Professor Archibald Geikie of London, Professor George Davidson of San Francisco, Professor W. C. Kerr of North Carolina, and Mr. R. H. Budden of Florence, Italy, were elected Corresponding Members.

Accounts were read of the May Walk, of the June Excursion to Mt. Ascutney, the Field Meeting at Jefferson, N. H., and the Autumn Excursion to Manchester, Vt.

It was voted that action on the proposed amendments to the By-laws should be taken at the early part of the next regular meeting.

Major Jed. Hotchkiss gave an interesting address on "The Appalachian Mountains of the Virginias," explaining in detail the profile of the country from the sea to the mountains, and showing that the essential formation of all parts of the Appalachian system might be found in Virginia. He referred to the parallelism and great length of the ranges there, as compared with the mountains of New England, and closed with a vivid description of the Shenandoah Valley, and the effect of its configuration in producing certain incidents in the War of the Rebellion.

Remarks were made by the President, and Professors Hitchcock, Fay, and Niles; and on motion of Professor Lanza a vote of thanks was passed to Major Hotchkiss for his address.

Mr. John Ritchie, Jr., read a paper on the ascent of Mt. Stinson, Rumney, N. H.; and remarks were made in connection with the subject by Professor Hitchcock, referring to the bowlders here and elsewhere in New Hampshire, and also by the President, Professor Fay, and Mr. Perley Ramsay.

November 8, 1882. — Forty-second Corporate Meeting.

President Pickering in the chair.

Twenty-three candidates for membership were nominated, and those presented at the last meeting were all elected.

The Corresponding Secretary read a letter from Professor Davidson of San Francisco, accepting Corresponding Membership; also a letter giving an account of an extraordinary single day's walk, taken by Messrs. George A. Sargent and Eugene B. Cook, starting from the Ravine House in Randolph, traversing all the northern peaks of the Great Range, descending the Crawford Path, and returning to the Ravine House by way of the Cherry Mountain Road—a total distance of about forty-two miles.

The following changes in the By-laws came up for action, by special vote at the last meeting.

I. Strike out the word "two," before "dollars," from Art. III., and insert the word "three" in place thereof.

II. Strike out the word "two," before "dollars," from Art. XIII., and insert the word "three" in place thereof; also insert, after the words "annual meeting," "and shall be entitled to receive one copy of each of the current publications of the Club."

III. Strike out the word "thirty" from Art. XIV., and insert the word "forty" in place thereof.

It was voted that if a vote on these changes be not reached by 5.30 P.M. action on them should be postponed until the next meeting of the Club.

It was moved that the first amendment be adopted. Remarks were made by Professor Fay, Mr. Scott, Colonel T. W. Higginson, Mr. C. H. Ames, and Rev. W. A. Start. The vote was taken by ballot, and the change was adopted by a vote of thirty-one to five.

The second amendment then came up for discussion, and it was moved to amend the same by striking out all after the word "thereof." Mr. Edmands stated that it was his intention, if the proposed change passed finally with his amendment, to offer a vote by which the Club should instruct the Council to send the regular publications of the Club to members until otherwise ordered. The amendment of Mr. Edmands was carried, and the ballot on the second amendment, as amended, resulted in its adoption by a vote of thirty to seven.

The third amendment was taken up, and after remarks by Professor Fay, Mr. Ritchie moved to amend by striking out the word "forty," and inserting "forty-five" in place thereof. After remarks by Mr. Ritchie and Mr. Edmands, the amendment was lost, and the ballot on the original amendment, resulted in its adoption by a vote of thirty to four.

It was voted that notice of the first amendment should be placed upon the notice of the next meeting, together with that of the second and third, so that final action should be taken upon all three at that time.

Mr. J. R. Edmands presented his report as Councillor of Topography, exhibiting and explaining one of the instruments used in his department during the summer.

December 15, 1882. — Forty-third Corporate Meeting.

In the absence of the President and Vice-President, Mr. A. E. Scott was elected Chairman.

Six candidates for membership were nominated, and those presented at the last meeting were all elected.

The Chairman exhibited a bracelet, composed of various woods, which had been presented to the Club by Mrs. Jared Sparks, and a vote of thanks to Mrs. Sparks, for the same, was passed.

On motion of Mr. R. F. Curtis it was voted that the President of the Club be requested to appoint a committee of three, on nomination of officers for the ensuing year. The President subsequently appointed Colonel C. W. Folsom, Mr. W. H. Ladd, and Mr. John Ritchie, Jr.

On motion of Mr. Curtis it was voted that we hold a reception, as in the past three years, and that the President be requested to appoint a committee, with full power to arrange for the same. The President subsequently appointed Mr. J. R. Edmands, Miss Susan Hale, Miss Elizabeth Upton, Dr. F. W. Williams, and Mr. W. Eliot Fette.

The proposed changes in the By-laws, as passed at the last meeting, then came up for final action.

After remarks by Professor Fay, a vote was taken on the first amendment, resulting in its adoption by a vote of thirty-two in favor, and one opposed.

The ballot on the second amendment resulted in its adoption by a vote of thirty-four in favor and three opposed.

The ballot on the third amendment resulted in its rejection by a vote of five in favor and thirty opposed.

It was voted that the Council be requested to distribute gratuitously, until further notice, one copy of each issue of *Appalachia* to each member of the Club who has received his membership ticket for the year.

Professor C. E. Hamlin presented his report as Councillor of Natural History. (See p. 168.)

Mr. W. H. Pickering presented his report as Councillor of Exploration. (See p. 179.)

Mr. W. O. Crosby read a paper entitled "The Mountains of Eastern Cuba." (See p. 129.)

Mr. Scott then presented his report as Councillor of Improvements. (See p. 183.)

A vote of thanks was passed to Mr. Scott for his valuable services to the Club as Councillor of Improvements during the past three years.

It was voted that one dollar of the three-dollar admission fee be remitted by the Treasurer to those elected and those nominated at this meeting.

January 10, 1883. — Forty-fourth Corporate Meeting.

In the absence of the President and Vice-President, Mr. A. E. Scott was chosen Chairman.

Seven candidates for membership were nominated, and those presented at the last meeting were all elected.

Mr. J. Ritchie, Jr., for the committee on a Winter Excursion, reported, giving details of the arrangements for the excursion to Jackson, N. H., to take place on the 18th inst.

Mr. Edmands, for the committee on the Annual Reception, reported the arrangements for the Reception to be held at the Hotel Vendome, on the evening of January 31.

Mr. W. H. Ladd, for the committee on nominating officers for the ensuing year, presented a written report, with a list of nominations for all offices except that of Recording Secretary, and recommending that the two Secretaries and the Treasurer be appointed a committee to present to the Club a nomination for this vacancy. The report was accepted and subsequently adopted.

The Recording Secretary, Corresponding Secretary, and Treasurer then presented their annual reports, which were accepted and ordered to be placed on file. (See pp. 161, 163, 166.)

The following officers were then elected by ballot, in accordance with the recommendation of the committee: —

President, John Worcester; Vice-President, A. E. Scott; Corresponding Secretary, Charles E. Fay; Treasurer, Charles W. Kennard. Councillors: Natural History, Charles E. Hamlin; Topography, J. Rayner Edmands; Art, Miss Susan Hale; Exploration, Eugene B. Cook; Improvements, Wilbur B. Parker.

Mr. Scott, the Vice-President, then took the chair.

Mr. William C. Bates read a paper on Jamaica Mountains and Scenery, giving a detailed account of his experiences in travelling through the island,—the character of the roads, surface, views, mountain ascents,—and an interesting sketch of the appearance and conversation of the native inhabitants.

The Annual Reception of the Club was held at the Hotel Vendome, on the evening of January 31, about one hundred and ten members and friends being present.

February 14, 1883. — Forty-fifth Corporate Meeting.

President Worcester in the chair.

Twenty-two candidates were nominated, and those presented at the last meeting were all elected.

The Corresponding Secretary made a report of the correspondence of the preceding month. This contained, in addition to responses to letters of inquiry sent to several foreign clubs, with respect to the possibility of obtaining back numbers of their publications, a notification of the change of location of the Central Committee of the Deutscher und Oesterreichischer Alpenverein, from Vienna to Salzburg; the prospectus of a monthly periodical to be entitled the "Deutsche Touristen-Zeitung," and to represent, not only the geographical and touristic interests of Germany, but of the civilized world; and, especially, a circular from the Central Committee of the Deutscher und Oesterreichischer Alpenverein, inviting this Club to send a delegate to a conference to be hereafter appointed, which shall consider measures looking to a Union of the leading Alpine corporations of Europe and America, and to the promotion of more intimate relations among them by the creation of an international bureau, and the establishment of an annual reunion. The matter of appointing a delegate, in accordance with this request, was subsequently referred to the Council, to report back to the Club.

The Corresponding Secretary also announced the list of books and periodicals received since the last meeting; presented samples of the bindings adopted for the library; and reported that nearly all completed volumes therein had been bound. He also recommended the creation especially of periodical clubs among the members, so that those persons interested in any of the foreign journals, received by interchange, should be able to see them regularly and without unnecessary delay. A map of North Carolina, recently completed by Professor W. C. Kerr, a corresponding member of the Club, was exhibited, and excited favorable comment.

It was voted to postpone the election of Recording Secretary one month.

Mr. W. H. Pickering read an account of the Winter Excursion to Jackson, N. H., in January, and illustrated it by lantern views from photographs taken by himself during the trip.

Professor S. P. Langley, of Allegheny Observatory, made a short address, referring first to the map of North Carolina upon the wall. He then described some investigations, made by himself at considerable altitudes, tending to prove the existence in the atmosphere, even at the tops of very high mountains, of fine particles, which might be called mountain dust. He detailed some of his observations on Teneriffe, Mt. Etna, and Mt. Whitney, and referred to the possibility of this mountain dust extending throughout inter-planetary space, so that it might even be considered as cosmical dust. The address was illustrated by lantern views of various mountains and of the moon.

Mr. J. Ritchie, Jr., read a paper by Mr. John Tatlock, Jr., of Williams-town, entitled "Some Recent Changes in the Barometrical formula of Laplace, as applied to the White Mountain Region." Remarks were made by Professor E. C. Pickering.

March 14, 1883. — Forty-sixth Corporate Meeting.

President Worcester in the chair.

Ten candidates for membership were nominated, and those presented at the last meeting were all elected.

In regard to the matter referred to the Council at the last meeting of the Club, — that of appointing a delegate to a future conference looking to a Union of the leading Alpine corporations of Europe and America, — Mr. J. R. Edmands reported that the Council recommended replying to the invitation "that, inasmuch as, if the Union were established, the meetings would probably be continued year by year, it would not be convenient for this Club to send delegates regularly, on account of distance; but that we should be glad to open relations with the Union by correspondence, and to be represented occasionally by delegates, as opportunity might offer." The report was accepted and adopted.

Professor Fay, for the committee on nomination of Recording Secretary, reported the name of Mr. Rosewell B. Lawrence, as the nominee of the Committee. An election of Recording Secretary was then held by ballot, and Mr. Lawrence was unanimously elected, and subsequently duly qualified for the office.

The Corresponding Secretary presented the letters received since the last meeting. These included an acceptance of correspondence by the Società degli Alpinisti Tridentini; a favorable response from the Oesterreichischer Touristen-Club, to a request for the back numbers of their publications; and a note from Lieutenant Schwatka, corresponding member of the Club, accompanying a donation to the library of a bound copy of the "Good Company Magazine," containing his articles under the title "In the Land of the Midnight Sun." Thirty-five numbers of exchanges had been received during the month, from eleven of the corresponding societies, besides a copy of an elegant monograph from the U. S. Geological Survey, "The Tertiary History of the Grand Cañon District, with an Atlas," by Captain C. E. Dutton. (See p. 159.)

Professor E. C. Pickering read a paper entitled "Mountain Observatories" (see p. 99), stating at the outset that although the obligation had been removed from the retiring president, of delivering an address at the close of his term of office, yet he hoped that the future presidents would at least feel free to do so, and that his paper was intended to furnish them a precedent.

Mr. A. E. Scott read a paper on the "The Twin Mountain Range." (See p. 107.)

Mr. R. B. Lawrence then read a paper entitled "Two Weeks in Norway," giving a vivid description of his travels among the mountains and fjords of that country. The paper was profusely illustrated with lantern views, and proved very entertaining.

Excursions of the Season of 1882.

ON the afternoon of Saturday, May 27, the usual half-day excursion known as the MAY WALK was made by a party of about one hundred and ten members of the Club and their friends. Going by a train from the Eastern Station to Saugus, the company found its way to the foot of Breakheart Hill, about two miles from the railway station, some in barges, but the majority on foot. The path lay, for a portion of the way, through woods fragrant with spring odors, along the very edge of a pretty sheet of water. The hill was a rough, rocky ridge, its sides covered with a young, scrubby growth, — through which a path had been bushed out at the direction of the Committee of Arrangements, — but quite clear at the top, which was a long, irregular crest. The air was very clear, especially seaward, and a fine view was afforded of the bay, and incoming and departing vessels. The landward prospect was largely over the lines of hills, similar to the one on which the party stood, and the intervening wooded valleys, with occasional glimpses between the heights to remoter blue horizons. Professor Niles, ex-president of the Club, spoke of the geology of the region. After spending an hour upon the summit the party returned as it had come, and reached Boston soon after sunset, having enjoyed the most successful trip of the kind ever made by the Club.

The arrangements for the JUNE EXCURSION being perfected, a party of about one hundred and twenty-five left Boston on the morning of the 16th, taking special cars over the Boston, Lowell & Concord and the Northern railroads for Newport, N. H. A stop was made at the station for Lake Sunapee, and nearly all enjoyed a sail over this delightful but little-known lake. The party completely filled the available accommodations at the Newport House, Newport, where a stop was made for the night. On the morning of June 17 an early start was made, and the train was taken as far as Claremont, where carriages were in waiting to convey the party to the foot of Mt. Ascutney, in Windsor, Vt. Nearly all of the party took advantage of this ride, and nearly a hundred started up the mountain, two thirds of whom reached the summit. Here a party of a dozen or more of the Geological Class of Dartmouth College, under the charge of Professor Fletcher, was met. The day was exceedingly warm, the black flies quite troublesome, and the distant view obscured by haze; but the nearer prospect of the fertile valleys of Vermont, and less distant mountains, more than repaid the effort of the ascent. Late in the afternoon the Club returned to Claremont, where many members took train for Boston, reaching there late in the evening.

Eighteen of the company remained at Claremont over Sunday, and an equal number spent that day at White River Junction. The Claremont party nearly all took an early train on Monday for White River Junction, meeting the party already there. Visits were made by both parties to

Dartmouth College, and the last of the company returned to Boston on Tuesday evening.

The AUTUMN EXCURSION for 1882 was made to Manchester, Vt., the objective point being Mt. Equinox. A party of about ninety-five left Boston on the morning of September 28, three others joining them after starting. The Fitchburg Railroad furnished two special cars through to Manchester, which was reached early in the afternoon. The accommodations furnished at the Equinox House were excellent, all being given rooms without delay. On the following morning a large party was organized for the ascent of Mt. Equinox. Owing to a misunderstanding, a number who desired to ascend were not accommodated with carriages to the mountain, and thus failed to reach the summit. The day was not very clear, and was quite cold. A fair view was obtained of the Adirondacks, the Catskills, and the Green Mountains, and a most charming view of the valley in which Manchester is situated. Arrangements having been made at a late hour with the railroads, a party of thirty was formed to start that evening, pass the night in Rutland, and make the tour of Lake George the following day. This party left by early train on Saturday, and at noon arrived at Lake George via Whitehall. After the sail on the lake the party divided, fifteen returning to Manchester at night, others going directly through to Boston, and the remainder passing Sunday at Caldwell. The latter enjoyed a special excursion on Lake George, a tally-ho ride on Monday morning, and reached Manchester on Monday afternoon. By invitation of Mr. Spofford, General Passenger Agent of the Bennington & Rutland Railroad, those of the party who were at Manchester on Saturday morning visited the extensive marble quarries and works at East Dorset. Many returned to Boston on Saturday, and others not until Wednesday.

On Saturday, Oct. 21, 1882, a party of members of the Club and their friends made an EXCURSION FOR AUTUMN LEAVES, including the ascent of Pack-Monadnock, in Temple, N. H. The party, numbering about ninety-three, left the Lowell Station at 7.30 A.M., and reached Wilton, N. H., at about ten o'clock, where carriages were in waiting to convey them to the foot of the mountain, some seven miles distant. A rather easy climb of a mile and a half brought them to the summit. The day was quite clear, the air bracing, the view very extended,—and rendered additionally beautiful by the great expanse of autumn foliage, which was at its best. The various ranges of the White Mountains were seen with greater or less distinctness, the slide on Tripyramid—about ninety miles distant—gleaming dimly through the light autumn haze. The carriage ride back was by a somewhat different road, and the whole excursion was one of the most enjoyable that the Club has made. The party returned by special train to Nashua, and reached Boston early in the evening.

OFFICERS FOR 1883.

President,

Rev. JOHN WORCESTER, Newtonville.

Vice-President,

A. E. SCOTT, 95 Milk St., Boston.

Recording Secretary,

ROSEWELL B. LAWRENCE, 23 Court St., Boston.

Corresponding Secretary,

Prof. CHARLES E. FAY, College Hill.

Treasurer,

CHARLES W. KENNARD, 30 Chestnut St., Boston.

Councillors :

Natural History, Prof. CHARLES E. HAMLIN, Museum of Comparative Zoölogy, Cambridge.

Topography, J. RAYNER EDMANDS, Harvard College Observatory, Cambridge.

Art, Miss SUSAN HALE, 94 Boylston St., Boston.

Exploration, EUGENE B. COOK, 26 Hudson St., Hoboken, N. J.

Improvements, DR. WILBUR B. PARKER, 28 Chestnut St., Boston.

Members added since May 27, 1882.

CORRESPONDING MEMBERS.

Davidson, Geo., San Francisco, Cal.	Kerr, W. C., Raleigh, N. C.
Geikie, Archibald, London, Eng.	Langley, Sam'l P., Allegheny, Pa.

CORPORATE MEMBERS.

Allyn, Miss Alice C., Cambridge.	Baker, Wm. D., Island Pond, Vt.
Arthur, Alexander A., Boston.	Barker, James M., Pittsfield, Mass.
Atkinson, Mrs. Wm. P., Jamaica Plain.	Basto, Mrs. Mary A., Boston.
	Bond, Lawrence. Boston.

- Brooks, Walter C., Boston.
 Burton, Alfred E., Boston.
 Butterworth, Hezekiah, Boston.
- Carpenter, Frank O., Lexington.
 Carpenter, Josiah, Manchester,
 N. H.
 Carrigan, E. C., Boston.
 Cassino, S. E., Boston.
 Chandler, George L., Auburndale.
 Chipman, George T., Boston.
 Cilley, H. B., Cambridge.
 Cilley, Mrs. J. G., Cambridge.
 Codman, Benj. S., Boston.
 Colburn, Miss S. E., West Roxbury.
 Cole, Otto B., Boston.
 Covell, Robert S., Boston.
 Currier, J. M'N., Castleton, Vt.
 Curtis, Miss M. G., Boston.
 Cushing, William, Boston.
 Cutter, Chas. K., Charlestown.
- Daniels, Miss A. E., Boston.
 Daniels, Mrs. A. F., Boston.
 Donnell, Miss Marion E., Chelsea.
- Eastman, Miss Jeannie, Boston.
 Edmands, Thos. R. B., Charlestown.
 Eliot, Miss Emily, Boston.
- Fitz, Miss Lizzie R., Boston.
 French, Geo. B., Holbrook.
 Frost, Rufus S., Chelsea.
 Frost, Mrs. Rufus S., Chelsea.
 Frothingham, Frederick, Milton.
 Frothingham, Mrs. Fred'k, Milton.
- Garrison, W. L., Roxbury.
 Garrison, Mrs. W. L., Roxbury.
 Gluck, David L., Boston.
 Goodwin, Frank, Boston.
- Halliburton, Miss Georgina, Ports-
 mouth, N. H.
 Harding, George, Philadelphia, Pa.
- Hawes, Frank M., Somerville.
 Hemenway, Alfred, Boston.
 Hitchcock, Lemuel, Marlboro.
 Hitchcock, Mrs. A. M., Marlboro.
 Hollingsworth, Mrs. P. R., Matta-
 pan.
 Holway, David N., Boston.
 Hooper, Wm. L., College Hill.
 Hoyt,¹ Eli W., Lowell.
 Hunneman, Miss Fanny, Roxbury.
 Hunneman, Wm. C., Roxbury.
 Hurd, Melancthon M., Cambridge.
- Ireson, Miss Emma D., Lynn.
 Ireson, Miss Kate C., Lynn.
- James, Mrs. John W., Boston.
 Josselyn, Miss A. P., Charlestown.
- Kinnicutt, Leonard P., Cambridge.
- Lane, Mrs. E. A., Boston.
 Lanman, Charles R., Cambridge.
- Morrill, Miss J. R., Roxbury.
 Morse, Miss L. H., Jamaica Plain.
 Murray, Miss Emma L., Roxbury.
 Murray, Miss Esther F., Roxbury.
- Parker, Miss Effie M., Boston.
 Parker, Gilman L., Reading.
 Parsons, Miss Caroline L., Boston.
 Pinkham, Mrs. E. G., Lynn.
 Plympton, Geo. W., Brooklyn, N. Y.
 Porter, Miss Emily M., West Rox-
 bury.
 Prescott, Miss Anna M., Charles-
 town.
 Preston, Gustavo, College Hill.
- Reed, Wm. Howell, Roxbury.
 Russell, Chas. Theodore, Jr., Boston.
- Saltonstall, L. W., Dorchester.
 Sargent, George A., Boston.

¹ Life-Member.

Sawyer, Mrs. J. H., Jamaica Plain.	Tiffany, Miss Mary A., West New-
Snow, Miss Isabel D., Boston.	ton.
Sparks, Mrs. E. L., Boston.	Tower, Mrs. Helen M., Cambridge.
Start, Edwin A., North Cambridge.	Vose, George L., Boston.
Stockin, Abner C., Boston.	Ward, Chas. D., Jersey City, N. J.
Swain, George F., Boston.	Webber, William O., Lawrence.
Tatlock, John, Jr., Williamstown.	White, Walter E., Holbrook.
Thacher, George W., Boston.	Whittier, James A. L., Boston.
Thacher, Mrs. Geo. W., Boston.	Williams, Miss Dora, Roxbury.
Thorndike, Mrs. D. D., Boston.	Young, J. Brooks, Boston.
Thurston, Wilmarth H., Providence, R. I.	



A

APPALACHIA.

VOL. III. BOSTON, DECEMBER, 1883. No. 3.

The Presidential Range from Jefferson Highlands.

By J. RAYNER EDMANDS.

Read April 11, 1883.

IN describing the Cherry Mountain route from Gorham to Crawford Notch, Starr King says:¹ "After the first mile from the Alpine House in Gorham, we are in company with the White Mountains proper for twenty-five miles. We take them into fellowship gradually. The range is in the shape of the body of a figure five, and we go round the bulge of it, formed by the curve in which the five largest mountains are set. First Madison and Adams come into view, and we drive directly by their base and under their summits in passing over Randolph Hill. . . . Next, after passing the great ravine in Mount Adams,² . . . Mount Jefferson comes into view. . . . Riding a little farther on, we see the summits of Pleasant, Franklin, and Monroe start out over the forests on the left. Next, Mount Clay makes its appearance, and then, as we look back, the ascending line of Washington shows itself last of all, though it is the centre of the range, leaving the wilderness behind it as it mounts to a rocky crest. The point we speak of now is Martin's in Jefferson, about thirteen miles from Gorham. . . . Goethe somewhere gives a picture in words of a typical Alpine landscape. . . . Compared with such pictures the White Mountain scenery must seem monotonous. But there

¹ The White Hills, p. 380 *et seq.*

² King's Ravine.



is no point in New Hampshire where its monotony is so poetic and sublime, where the wilderness, miles and miles in extent, unenlivened by a clearing or the smoke of a cabin, unravaged by axe and unspotted by fire, flows off in such noble lines and folds from the shoulders of the bleak hills." We now know this part of the route as Jefferson Highlands, and confine the term Cherry Mountain Road to the part of the route which actually crosses the flank of that mountain.

From the upper piazza of the Mount Adams House we get all these mountains, except Pleasant, on the right-hand, the Mitten and Deception mountains in front,—long may they retain their unbroken forests,—Cherry Mountain beyond, and, on the left, a vista across the valley of the Connecticut, over which a sunset light often brings out the blue domes of distant mountains in Vermont. But when we try to sketch this, we find the same difficulty as with a view from a mountain summit: we are at once launched into the middle distance, and the picture has no foreground, on which the eye may rest in its involuntary estimation of distance and height. The writer, therefore, used to like to take friends to a certain knoll, where the grandest portion of the view is heightened by the greatest attainable amount of foreground; and he is informed that a private cottage has since been built near, if not exactly upon, the spot. The profile¹ was taken here in August, 1876, with the camera first constructed.² For the most part the minor lines, which bring out the surface features of the mountains, were also drawn in the camera, and conform to something actually seen in the instrument; but some of them were derived from profiles at other points in the vicinity, there being vacancies in the principal drawing. For such interpolations accuracy cannot be claimed. Again, it was found necessary to use the imagination, assisted by memory, for corresponding lines upon Mt. Bowman and the extreme lower flanks of Adams, in order to avoid a blank which would mar the picture. The immediate foreground has been drawn by an artist who has not visited the spot; and although he conformed to whatever was given on the original drawing, no accuracy of detail has been attempted for his portion.

¹ See Pl. V.

² Described in APPALACHIA, Vol. I. p. 61.

NOT

From no part of the road through the town of Jefferson can one see the whole of the Great Range, — or the Presidential Range, as it is better called, — since Jackson, Clinton, and Webster are completely out of sight, while Franklin and Pleasant are often hidden. But here we have the northern spur in full grandeur. It is impossible adequately to describe such a landscape. The adjectives and similes of a Starr King may inspire us with a desire to see for ourselves, or they may recall the view, or they may furnish an interesting comparative study in connection with our own impressions; but seldom can they successfully anticipate the scene for us. Rather let us assume a visit to the spot on the reader's part, and trace the features in detail, with the aid of the plate.

The names of the most conspicuous mountains are given upon the plate. Clay is the mountain (on the right of Jefferson) which divides the crest-line of Washington, a portion of the latter appearing between Clay and Jefferson. The continuation of the crest to the right from Monroe is a part of Franklin. Bowman is the hill which apparently blocks the entrance to the Ravine of the Castles, between Adams and Jefferson. Dartmouth is the highest, actually and apparently, of the Mitten Mountains. The name Mitten Mountain¹ is usually applied, at Jefferson Highlands, to the hill on the left of Dartmouth, which, on our plate, first interrupts the crest-line of the Presidential Range. On the ridge which connects Dartmouth with Jefferson, however, is a summit occupying the position assigned to Mitten in Osgood's Guide. From one point of view it is hidden by what we call Mitten, but a walk of half a mile eastward would reveal it.

On the top of Mt. Washington are seen some of the buildings. The summit of Clay is viewed in such a direction as to appear single. That of Jefferson, in whatever direction it be seen, usually appears notched as in the plate, since it consists of three knobs, one of which is likely to be hidden. The summit near the centre of symmetry of Adams is the second

¹ Regarding the origin of the name, there is a legend involving the loss of a lady's mitten; but Professor C. E. Fay has discovered the name Millen Hill, applied to what may be our Mt. Dartmouth (it is difficult to identify with precision on old maps) on Holland's Map, 1784.

in height. The principal summit is the pointed one on its left, under which and a trifle to the left may be seen the fourth in height. The apparent altitude of the principal summits is diminished by its greater distance. The third summit¹ in height appears half-way between the main summit of Adams and that of Madison.

Nowell's Ridge is the flank of Mt. Adams, seen under its highest summit, descending from its fourth summit directly toward the eye. The name should not be carried as far eastward as the nearer wall of King's Ravine, which, in some lights, is seen to be another buttress from the same summit, and is so shown on the plate. The farther wall of King's Ravine starts under the third summit of Adams, and, descending less rapidly, blends with the left-hand ridge of Madison. The Castellated Ridge descends toward the eye from the summit of Jefferson. The plate cannot do justice to its roof-like sharpness. Bowman is a foot-hill of this ridge, although the connection is not apparent at this point of view. The ridge of Jefferson, which descends to the right, has many points of resemblance to the Castellated Ridge, when the former is viewed from the northern slopes of Clay or Washington. The right-hand ridge of Clay forms the opposite wall of the ravine, which lies on the left of the Mt. Washington Railroad in ascending.

The old Lancaster Path to Mt. Washington crossed the lower portions of the ridges which connect the Mitten Mountain with Mts. Jefferson and Clay. The writer traversed it in 1869, but it is now entirely disused.

If the ridges are the salient features, the ravines are the impressive ones. To them we owe the ever changing lights and shades which make us never tire of the view. King's, whose walls are seen in profile, is the most famous. The Ravine of the Cascades faces us on Adams at the right of Nowell's Ridge, its silvery threads of water showing in the sunlight, after every rain. The bowl-shaped Ravine of the Castles is largely hidden by Bowman, but the ruggedness of

¹ It was called "John Quincy Adams" by Starr King, and this has furnished a precedent for calling the second summit "Sam Adams"; but the good taste of the practice is often questioned.

its head-wall is very suggestive, even when seen at this distance. The little ravines deeply cut into the northern and western flanks of Jefferson, and a similar one on Dartmouth, are attractive elements in the scene. Those on the northern sides of Monroe and Franklin contain glistening patches of micaceous rock.

Thus can we point out details, the knowledge of which increases one's enjoyment of the actual scene; but neither words nor drawing can reproduce the effect of the contrast between the deep green of the lower slopes and the gray of the rocks above. For a few days in September there is also a special effect, caused by the turning of the leaves in the belt of alders just above the tree-line. A band of spectrum tints then traces a sort of contour line into each ravine and out around each ridge.

The Mountains and Scenery of Jamaica.

BY WILLIAM C. BATES.

Read January 10, 1883.

For many years my heart had turned towards the mountains of Jamaica. Blue Mountain Peak had drawn me by that strong affinity which all mountain lovers recognize, and vague rumors of unimagined beauty lurking in ravines and passes had haunted my waking thoughts and day-dreams, until at last thither lay the path of duty, and several visits to Jamaica in the way of business combined to fill the storehouse of memory with pictures of every kind dear to Nature-worshippers.

Jamaica lies about seven days by steam from New York, and the passage costs fifty dollars by the very good steamers of the Atlas line. The sea-voyage is of course subject to the usual vicissitudes, but one may fairly count upon a pleasant trip; and in leaving New York in winter it is delightful to run into the soft tropic breezes which, after Hatteras, generally

welcome the voyager. We sight several of the Bahamas,—low-lying coral islands, shining like emerald gems in a setting of liquid sapphire. We meet patches of gulf-weed,—fragments of that sargasso which we are told impeded the vessels of Columbus. Watling Island, near which we sail, is thought by some to have been his first landfall; and, although ourselves only three days at sea, we can imagine the relief to the weary-waiting eyes of the hopeful navigator the first sight of this oasis in the desert of waters must have been. We pass through the Crooked Island Passage; sight the eastern end of Cuba; note the successive terraces and mountain-ranges which give a foretaste of what an interest the tropic mountains will have to the explorer.

The approach to the island of Jamaica on the morning of the seventh day awakens all the enthusiasm of the traveller. Up with the dawn, he sees the ranges back of Morant Point cloud-capped, and only here and there suggested by the occasionally parting mists, as showers chase each other from peak to base. The rising sun dispels the clouds, and the Blue Mountain Range is before us, with various summits from four to eight thousand feet above the near-lying sea. The ravines still hold the clouds, as if loath to part with their sheltering shade. From here to Kingston—some thirty miles—a series of mountains glide by as in a panorama; and at length we reach Port Royal, which stands at the entrance to Kingston harbor. Did not those sharp peaks and ridges back of Kingston woo us so strongly, we could be interested for a little time here at Port Royal, sleepy and dead as it now seems; for the town has a history, if its scenery is limited to cocoanut-trees. Even these seem to wave a soft welcome with their fern-like fronds; but the mountains call us, and without delay we reach Kingston, and plan for a new conquest of grandeur and beauty.

Kingston stands upon a plain, which in ten miles rises gently to the foot of the hills. The mountains seem to crowd down to meet the sea, so close that every drive is in full view of some range, and the St. Andrew's mountains form a background to every picture. This range is Alpine in form,—sharp peaks, scarred sides, “knife-edges,” inaccessible slopes,

bare rocks, too steep for soil to hold, yet mainly covered with a luxuriant tropic vegetation. The drives about Kingston mainly have these in view. The Rockfort Road has a long ridge on one side, the bay on the other. The ridge — four or five miles long perhaps — was dotted from end to end with blossoming aloes (the century-plant, as we call it), having stalks fifteen to twenty feet high, with yellow compound flowers, as big as one's hat, on the upper half. Over the waters of the bay an occasional pelican poised in his flight to drop like a plummet upon his prey beneath. Beyond the bay a long spit of sand connects Port Royal with the island, and is planted thickly with cocoanut-trees, which give a picturesque outline against the sky.

One is not sorry to leave the torrid plain of Kingston for the temperate region of the hills. Good roads lead off in every direction; some end at the foot of the hills, where only bridle-paths communicate with the succession of coffee estates beyond. The higher the altitude the better the coffee, it seems; and it is wonderful what an amount of living and cultivation lies beyond the reach of carriage roads. In penetrating the hills numberless streams must be crossed. Every valley has at times its roaring torrent. Xaymaca, the Indian name found here by the Spaniards, signifies the Isle of Springs. It is well if one's journeyings are in the dry season, as there are no bridges to these mountain torrents, and when the rivers are "down" they are impassable for days at a time. There are numerous hospitable coffee estates perched among the hills at an altitude of about four thousand feet, which give superb views of hill and plain and sea. A visit of two or three days at one of these is something to remember, not only for the views obtained, but from the whole novelty of existence in this tropic luxury of vegetation, surrounded by new forms of plant and animal life.

The ascent of St. Catherine's Peak is one of the most natural and obvious excursions from Kingston. It is not specially difficult; but it should be borne in mind that a tropical mile differs much from one's usual idea of that distance. The ascent and return can be accomplished in one day from Kingston; though it is much better to go to Gordontown — some

nine miles — the evening previous, that the start may be at dawn rather than after the sun has gained his power. Exercise under a tropic sun will be avoided as much as possible at noonday, even at the altitudes of these hills. Taking ponies at the terminus of the carriage road, we have a ride of about seven miles before us, but such a ride as no climber of northern mountains only can have experienced. Not that the path is difficult, but more picturesque. We pass through the military settlement at Newcastle, twenty-five hundred feet above the sea, and come to the altitude of the tree-ferns, between and under which the path winds. We have left below the mango-trees, whose rich golden fruit paved the path, but still have the gold and silver ferns, whose delicate fronds we turn up with the whip as we pass. We get beyond the cabins of peasants, who find this altitude too cool for comfort; banana and plantain trees still indicate some negro provision grounds; and ravines gape closer and closer as we cross some knife-edge connecting opposing slopes. Presently we come upon a clearing, and we find the summit before us nearly clear both of trees and underbrush,—a thing unusual in tropical mountains, whose summits are more frequently covered with a dense growth of lofty trees, making any outlook impossible. St. Catherine's Peak is free from trees, and not always obscured with clouds. The altitude is given as fifty-three hundred feet; but being so near the sea, which seems to reach its base, the effect is that of a considerably greater height.

There are numberless peaks, crowns, and summits in the vicinity; indeed, the neighborhood well illustrates the comparison attributed to Columbus, that Jamaica resembles the appearance which would be presented by a piece of blotting-paper crumpled in the hand and dropped upon the table. It has in this section the effect of a bubbling mass of mountains suddenly cooled at the boiling-point.

Every one knows how poorly any arrangement of words can convey the impressions of a view from a mountain summit. We do not say that this from St. Catherine's is the grandest in the world, but that it is grand enough. As we have said, these neighboring hills, with every variety of form,

peak, dome, ravine, and gorge; the plain of Kingston; the sugar estates, with variety of greens; the caffetals, shining white, dotted here and there among the hills; a glimpse of the Gardens River; the harbor of Kingston; the dim lines of cocoanut-trees of the palisades; and, beyond, the blue Caribbean Sea, with a few coral islands just over Port Royal, — is not all this enough for one view? Sky and sea meet to form a rim to the concave which seems to hold the town and harbor and the foot-hills. Far away on the horizon the mountain tops of Cuba and Hayti are faintly discerned.

Most of the mountaineering in Jamaica must be done on ponies; for the hills seem to be connected and intersected with good bridle-paths, frequently the only approach to large coffee estates. Negro cabins and provision grounds are scattered here and there; and these secure a constant travel, which is necessary to keep down the undergrowth. In this way we approach the Blue Mountain, some twenty-five or thirty miles from Kingston, which is not, however, visible from that point. Crossing numerous streams, and rising all the time, past successive summits and plantations, we come to Abbeville, a coffee estate some four thousand feet above the sea; not the highest in the island, but sufficiently high to produce coffee equal to any. Readers of Trollope will remember that from here he made the ascent of Blue Mountain Peak. No Appalachian would be content with his scoffing depreciation of mountain climbing. We know the glorious exultation consequent upon conquering Nature's fastnesses too well to be deterred by a trifling perpendicular of two hundred feet or so at "Jacob's Ladder," which is here to be surmounted; but unluckily it is true that, until some tropic club clears a point on Blue Mountain, the labor of climbing will not be repaid by a view such as would be presupposed at this height of eight thousand feet. Negroes and cutlasses must be brought along, and generally, it is said, drenching showers are experienced, all to find one's self in a thicket of undergrowth, at the foot of tall trees, from which nothing can be seen. But there is this to be said of the ascent of Blue Mountain: a failure to reach the peak will still leave enough delightful memories to repay the attempt.

A carriage drive across and around the island is the best way to come to an appreciation of the scenery of Jamaica. Such a drive will give the variety we should expect in a tour among the Adirondacks, the White Hills, and the sea-shore. Not that this has all, but some of the charms of each. The island is some sixty miles wide by one hundred and seventy in length, and three weeks may be well employed in a drive across and around it, over very good roads for the most part. Passable lodging-houses give entertainment, and a profuse hospitality from residents welcomes the respectable traveller. We leave Spanish Town, once St. Jago de la Vega, and come at once to the "Bog Walk," one of the natural lions of the island,—a notch of perhaps five miles in length, with sharp sides crowding down upon the road, with a stream at the road-side. The walls of this notch are nearly perpendicular much of the distance. Long lianes and vines drape the sides, where foothold is lacking for trees. By the river-sides clumps of bamboos rustle with a melody of their own. Who will give us the language of trees,—the voice of palm, bamboo, pine, oak,—each *sui generis*, if we think upon it? Parasites hang upon tree-trunks; orchids drop trails of blossoms, alike the rivals and attraction of humming-birds and butterflies. Wild sugar-cane straggles in graceful *abandon*; and the ruins of a Spanish fort, already old when the Pilgrims landed at Plymouth, guard the exit from the notch near the quaint village of Linstead, where studies of peasant life may occupy the traveller till he resumes his journey.

The next day Mount Diablo is surmounted,—about two thousand feet above the sea, as we remember,—bringing us to the almost temperate plateau of the St. Ann's district. This day's drive, commencing at Linstead, over Mount Diablo, in the early morning, while the mists still nestle in the valleys or flee from the rising sun, ends by a sharp descent through the Gully Road at St. Ann's Bay. Again the sea,—and at "Christopher's Bay," where the patient Columbus spent nine months waiting for supplies, for which he had sent to Hispaniola. The Gully Road is a weird place, as steep as carriage roads can be; some two miles long, and overshadowed by trees and steep banks. The sun may sometimes penetrate it,

but not in the afternoon, if even at noonday. Dank moss and nodding ferns line the banks; the boughs meet overhead; a semi-twilight pervades. Here is the home of the solitaire,—strange bird of the forest, seldom seen by man, its call so mournful that it has been likened to that of a lost soul.

“ A cry as of the pained heart of the wood,
The long despairing moan of solitude
And darkness and the absence of all good,

“ Startles the traveller with a sound so drear,
So full of hopeless agony and fear,
His heart stands still and listens like his ear.

“ The guide, as if he heard a death-bell toll,
Starts, drops his oar against his gunwale's thole,
Crosses himself, and whispers, ‘ A lost soul!’ ”

At St. Ann's Bay one turns from the charming shore, where pink-lipped conch-shells idly wait to be kissed by the morning sun, to meet within a few hundred yards the cascades of Roaring River, which is here a mad torrent, divided into a dozen branches, each breaking into cascades of ten to twenty feet, some quite abrupt, and all beautiful. The tropic woods give grateful shade; and the whole recalls

“ How do the waters come down at Lodore? ”

From St. Ann's Bay to Falmouth, thence to Montego Bay, the scenery is less picturesque, but scarcely less interesting. Sugar estates are numerous. The graceful palmiste abounds,—the finest of all the palms, a straight clean trunk, thirty, fifty, seventy feet high, surmounted by a tuft of long fronds, erect and drooping, the most graceful feathery form Nature presents. The cottonwood-tree is common here, as also acacias and *lignum vitae*. From Montego Bay to Savannah la Mar we again cross the high lands; cattle farms are frequent, and novelty awaits the traveller on every side. From Savannah la Mar the route is again by the sea to Black River, and thence over Spur Tree Hill to the high level of Mandeville. A temperate climate is again encountered; and, if time permits, a tour should be made among the Santa Cruz moun-

tains,— a charming region, three to four thousand feet above the sea.

While in explorations we are mainly interested in the various phases of Nature, her forms of mountain, wood, or stream, yet, to round out the real mountain-lover's character, human nature in its new manifestations should be observed with open eye and ear, as well as met with an open hand. The peasantry of Jamaica are always picturesque and frequently interesting. Jamaica is the black man's paradise. A bountiful Nature waits upon him, tempting him to "sweet do nothing" by the abundance she yields at the slightest of solicitations. The yam and sweet potato vie in the value of their product, the bread-fruit drops into the upraised palm of the negro, the plantain and banana hang a load of food at his open cabin window; he has but to add a little salted fish from the shops, and to this Nature adds a delightful condiment in the fruit of the ackie. If his occasional treat of beef is tough, he has but to rub it with the leaves of the pawpaw, and it rivals choice cuts of tenderloin. With leaves of the hibiscus he polishes his Sunday boots, if he has any; the soap berry helps him to wash his clothes; "chew-stick" polishes his teeth; cinchona cures his fever and if he has any other wants, the cocoanut palm is there, with its oil, fruit, fibre, etc., to supply them. Truly a bountiful nature, and in return he is a happy child of Nature; care runs off his light-hearted disposition as water from a duck's back.

Some good sense is in the Jamaica negro, and a growing desire to learn. He says, "I will not mek them call me 'waste time' no more, I will work in de cane-piece and learn book, and get money in de bank." Here is hope for the Creole. In the proverbs of a people we note the high-water mark of their intelligence; and some of the proverbs of the Jamaica negro are unique. Here are a few specimens. One which embodies a recognition of shrewdness, tact, and skill in practical affairs in distinction from theory is, "What de good of edication if he got no sense." Another hints at the necessity of strong application in the presence of opportunity, in "Studyration beat Edication." *Suaviter in modo* is inculcated in "Softly, softly, catch monkey." The exemption of the rich and powerful

from ordinary cares and troubles is suggested in "Rock-stone at river bottom never know sun is hot." The presence of a bountiful Providence pervading all nature is recognized in, "When cow tail cut off, God a'mighty brush fly for him." *Nouveau richesse* is met with: "When towel turn table-cloth there's no bearin' wid it." We say, "A mother's geese are always swans;" but they say, "John Crow [the tropic black buzzard] think him pickaninny white." The certainty of the laws of heredity is expressed in this, which has a strong local color: "Pig say, 'Mammee, what mek your mout long-so?' he say, 'Ah, my pickaninny, that same thing that mek my mout long-so, will mek yours long too.'" The oblique motion of the crab is accounted for in a manner which opens up an intricate suggestion of cause and effect, "Pride mek the crab go side-ways;" evidently beginning with turning the cold shoulder, as we say, by evolution, the lateral motion only becomes possible, — an obvious warning to supercilious humanity. But space forbids to linger by the way in these studies. Let us put down a few in a lump, the meaning more or less obvious: "Every day debil help thief, one day God help watchman." "Dark night hab no governor." "One time a mistake, two time a purpose." "Trouble neber blow shell." "When Cotton-tree fall down, Nanny goat jump ober him." "Man no done climb hill, no throw away stick." "Tek time wash ants, you see how him made." "Too much sit down broke trousur." "Spit in the sky, it fall in your face." The list might be much extended.

A goodly number of people go to Jamaica every year in search of health, and the number seems to be increasing. One can almost select his climate, as between the plain of Kingston and the highest residences there is a difference of four thousand feet. Many families in the hills will take lodgers, although, until good hotels or sanitariums are established, the accommodation, and consequently the travel, will be limited. But to the mountain lover the scenery of Jamaica offers an attractive field for exploration. A month's absence and an expense of one hundred and fifty dollars will yield a very good experience of Jamaica mountains, though a three months' trip is none too much in which to see the island properly.

The traveller in Jamaica, in the intervals of mountain climbing, will have enough to interest him in the forms of vegetation and industries new to him. Sugar and coffee, pimento and ginger, are the more obvious products; and then there are the great varieties of fruits, woods and plants, birds and insects, so that, whatever one's taste, he can find something to study and much to enjoy.

It is a curiosity in history that Jamaica at one time came near becoming an appanage of Massachusetts. Cromwell had a plan of interesting the Bay Colony in Jamaica by offering it as a dependency; and Major Gookin, on his visit to England about 1655, was consulted upon the subject by the Protector. But the Major doubtless showed that the infant colony had all it could attend to in the near neighborhood of Boston. Possibly Cromwell's knowledge of geography obscured a little the distance of the tropic island; but we can still acquire the best part of the island by the conquest of travel, — still capture its beauty and grandeur, its genial climate and wealth of production. And to that conquest the Appalachian Club is invited by one of their number who has only enthusiasm for the mountains and scenery of Jamaica.

Randolph.

BY MRS. L. D. PYCHOWSKA.

FROM the village of Gorham to Jefferson Highlands is a distance of about twelve miles. The road passes over a spur of Randolph Mountain, known as Gorham and Randolph Hill, and through the entire breadth of the township of Randolph. Its wonderful beauty is well known to all who have driven or walked over it. The Moose River, rising on Nowell's Ridge and running to the east, and Israel's River, rising in the ravine of the Cascades and in Spalding's Spring and running to the west, are its bordering streams.

The coldness of the waters in this section of the White Mountain region has more than once been remarked. In vari-

ous springs and brooks they stand at from 34° to 48° Fahrenheit the whole summer through. Numerous underground deposits of ice can alone account for this unusually low temperature.

To the east of the Randolph Valley lies Pine Mountain, overtopped by the Carter-Moriah Range, and to the west stretches the long line of Cherry Mountain. Southward, and within four miles from the highroad, are the summits of Madison and Adams. A little farther away, rises the top of Jefferson. The ridges, ravines, brooks, and cascades on this northern slope of the White Hills are wonderfully beautiful and easily accessible. A walk of two hours from the road places one on the breezy ridges, in the exhilarating atmosphere above the tree-line, among splendid cliffs, and, in the early part of the season, in the luxuriant flower-garden of Alpine blossoms which crowns these fascinating eminences.

Beginning with the Castellated Ridge, which slopes down from Jefferson, and proceeding eastward, the succession is as follows: 1st, Castellated Ridge; 2d, Ravine of the Castles; 3d, the "Emerald Tongue," dividing the Ravine of the Castles from that of the Cascades; 4th, Ravine of the Cascades; 5th, Nowell's Ridge; 6th, King's Ravine, with its branch containing Spur Brook and Chandler Falls; 7th, Durand Ridge, the queen of ridges; 8th, Snyder Brook Ravine, with Salmacis Falls; 9th, Gordon Ridge; 10th, the Bumpus Brook Ravine, with its branch and falls; and, 11th, Howker Ridge.¹ Howker Ridge divides into two parts, of which the lower portion of the one nearest to Bumpus Brook is known as the Blueberry Ledge. On it are some curiously fractured rocks, a "bear-pit," etc. On Town Line Brook, which flows between the two divisions of Howker Ridge, are Triple Falls, only a few steps from the road to the Glen, and often visited.

Each one of these ridges and ravines is worthy of a chapter to itself. But our subject is Randolph, and we must not permit ourselves to be led away by loftier topics.

¹ There are now paths up the Castellated Ridge, into the Ravine of the Castles and the Ravine of Cascades, up Nowell's Ridge,—the old one and various new ones,—into King's Ravine, up Durand Ridge, and Snyder Brook Ravine. Gordon Ridge is so named from the old Gordon trail, now nearly obliterated, which was an early way up Mt. Madison.

Yet must we delay for a moment to say a word on Pine Mountain, the last height of the Great Range toward the north. A party of visitors went from the Ravine House, past Wood's, on the Glen road, turned into the old valley or winter road to Gorham, near Howker's, crossed the Moose River for the third time near a lumber-camp, on one cabin of which is a sign "Moose River House," and there struck into a trunk logging-road, which they followed up into the depression between the two chief divisions of Pine Mountain. Ere long they left the road, and kept up through the open wood until the top of the mountain was reached. The distance from the Ravine House to the summit is about four miles.

A few steps to the east of the summit is a view-point giving the Androscoggin valley with its eminences and sundry more distant peaks in Maine. From the head of the fine cliffs on the southwesterly end of the mountain, is a most interesting prospect, embracing a near view of the Glen valley, with Madison, Washington, Wildcat, Carter Dome, Carter Mountain, and Moriah rising around it, and the hills seen through the Pinkham Notch, Mt. Langdon among the number, closing it in on the south. By aneroid measurement, Pine Mountain rises 2,385 feet above the sea.

To the north of the Randolph Valley rises the long line of Randolph and Crescent Mountains, extending from Boy or Ball Mountain in Jefferson Highlands, to Sugar Hill in Gorham, and up toward Berlin, bordering the Androscoggin. The entire length of the range cannot be far from ten miles. The lowest point of division in that portion where Crescent begins, is found back of the head of the Ice Gulch, which thus forms the dividing depression between Randolph and Crescent Mountains. Randolph Mountain has two principal heads, of which the eastern one is the higher. It measures about 3,179 feet, while the west peak stands about 3,035 feet. The highest point of Crescent Mountain (according to aneroid) is 3,227 feet. Lookout Ledge is in the neighborhood of 2,297 feet, and Safety Pond of 2,214 feet. Recent measurements make the Ravine House about 1,284 feet. These measurements are all above the level of the sea. The highest top of Randolph Mountain lies nearly north of

the Ravine House. It is overgrown with trees. A station of the United States Coast Survey is found not far below the top, on the southerly end, where there is an opening, and whence the view to the great range is especially fine. Mt. Washington is not visible from this point; but Madison, Adams, and Jefferson, with their ravines, lie close at hand across the Randolph Valley. Lafayette and the Twins close the distance in the southwest. By encircling the wooded crest, other outlooks may be found in other directions. Some of the members of the exploring party climbed small trees, and found that two such trees on either end of the summit gave an entire round of vision, including the Pond of Safety, Pliny and Pilot ranges, Dead River valley, Percy Peaks, Stratford Mountain, Dixville Range, Old Speck, Goose-eye, Ingalls, Baldcap, Hayes, Gorham, the Androscoggin valley, with Caribou and the Carter-Moriah Range to close the circle.

The distance from the Ravine House to the Coast Survey Station is about three miles. At the end of the road on the top of Randolph Hill, logging-roads may be found leading to the high col west of the top, and thence the way (in an easterly direction) through the open wood to the station is very short and easily traversed.

From the top of Mt. Washington Mr. C. E. Lowe has recognized parts of two ridges, running down from the west peak of Randolph Mountain. In turn, from one of these ridges, he has seen the summit of Mt. Washington, crowned with its buildings, rising above a depression in the col connecting Adams with Jefferson. The spot is only about ten minutes' walk from the path to the Pond of Safety.¹

This quaint name designates a small sheet of water, somewhat less than a mile in circumference, lying north of Randolph Mountain, in the singularly undulating valley filling the gap between Randolph and Pliny. Its curious situation (apparently nowhere in particular) has given rise to many comical

¹ An excellent path, carefully blazed by Mr. Cook, from Lookout Ledge, and well cleared out by Mr. Laban M. Watson and assistants during the past summer, now leads from the Ravine House (past Lookout Ledge, $1\frac{1}{2}$ miles) to the Pond, $4\frac{1}{2}$ miles.

adventures on the part of visitors, few parties going in, before the path was made, without having some strange tale to tell of confusion of mind with regard to directions, points of the compass, streams flowing the wrong way, or interviews with other visitors whose heads had gotten completely turned round. From an opening on its northern side is obtained a peculiarly picturesque view of the summits and slopes of Madison, Adams, and Jefferson. A few steps farther to the west brings one to the inlet, a potable stream, from whose mouth there is also a good prospect of Madison and Adams. The outlet flows out on the southeast, and then turns, as the Upper Ammonoosuc, to seek the Connecticut by a northerly and northwesterly course. Near Lowe's Camp, on the outlet, is a splendid spring of cold water, five feet deep. Apparently, the whole surface about this part is made of roots, overgrown with mosses, etc., through which one might break a passage and find water anywhere. The outlet flows through a series of boggy openings, in which are found pitcher-plants, *Cassandra*, *Andromeda polifolia*, *Calla palustris*, and other marsh growths.

During the summers of 1882 and 1883 the Councillor of Exploration of our Club several times visited Crescent Mountain. Innumerable logging-roads, fallen timber, jackstraws, etc., presented what obstacles they might, but could not prevent a pretty thorough investigation of the innermost recesses of the mountain. The summit is overgrown with trees; but there are fine cliffs looking out in various directions, which deserve further exploration, both for their own beauty and for the distant views they promise. In all probability the survey of Crescent will be completed during the summer of next year.

Meantime, some account of the famous Ice Gulch may not be amiss. This ravine is now readily reached by means of a spotted trail and partially cleared path extending from the top of Randolph Hill to the head of the Gulch, a distance of about three miles. The mountain wall is here lowered perhaps 300 feet, and, somewhat below the crest of this depression, a steep descent of 50 feet leads into a narrow gully, which soon opens through the head wall of the Gulch proper, giving pas-

sage to a rivulet. From this point it is not less than three-fourths of a mile to where the ravine loses its extraordinary character, and in this distance the descent is about 500 feet. The side walls vary from about 150 to 250 feet in height, and the width between them at the bottom varies perhaps from less than 100 to 300 feet. The lower part of this cleft is filled to an unknown depth with angular fragments of rock, having the same aspect as the "bowlders" in King's Ravine, although not generally so large. Evidently the process of filling up is still going on, for the steep walls are seamed with great parallel cracks, and the party crossed two large slides of recent date. The Gulch is divided into several chambers by the piling up of masses of these angular rocks at sundry points on the way down, so that the progress through the ravine consists not alone in climbing down and among these blocks, but up and over the dividing walls where they occur.

The greatest peculiarity of the place lies in its capacity to harbor a large supply of ice. All the interstices of the broken floor seem to be filled by it; for even where it is not exposed to the sight, its presence is betrayed by the chill air that breathes out of the dark caverns. In one place we found this forming a perceptible white vapor.

But the Gulch is not only curious; it is also very beautiful. The fine cliffs are crowned with tall spruces, firs, and hemlocks, outlined against the narrow strip of sky seen from below; and the sharp fragments that fill the floor are covered by a mantle of delicately shaded moss, green, yellow, and reddish. *Phegopteris polypodioides* and *P. Dryopteris*, *Aspidium aculeatum* (var. *Brannii*), and *Aspidium fragrans* were among the ferns noticed. Struggling for a living upon the rocks is a sparse growth of dwarf spruce (black and white), fir, and birch, looking more frost-bitten than that one finds at the tree-line on the great peaks. Late in August were found blossoms of Labrador tea, cowberry, and dwarf cornel. Here is truly the climate of more than 5,000 feet above sea brought down in the same latitude to an elevation of less than 2,000 feet.

At the lower end, where the cliffs cease, the rock-piled

floor breaks down suddenly, and the liberated brook, swelled by a tributary from the north, continues its course down an ordinary ravine. Here, as in a frame, is set a pretty glimpse of the Androscoggin valley and heights. There is a fairy-like spot at the top of this last parapet. The tiny stream has channelled for itself a fanciful passage over the lowest bed of ice, and finds a momentary rest in a basin of green moss, surrounded by delicate plants. Among these were *Pyrola secunda* and *Mitella nuda*.

Half a mile lower down, the stream plunges over a face of rock perhaps 60 feet in height, making a lovely cascade. To this fall, as yet unnamed, it has been proposed to give the name of Peboamauk (pronounced Peb'wamauk), meaning "Winter's place or home." At the foot of the fall, leaving the stream, one strikes a wood-road, which leads down to "Dixon's," and thence by road, or by a pathway which diverges from said road a little farther on and ascends Gorham Hill, to the highroad, passing from Gorham Village to Randolph Hill.

The town of Randolph offers so attractive a theme, whether its climate, waters, woods, vales, or heights be considered, that the writer fears to trespass on the time and attention of the reader, and hence can only close with a wish that each one may see and enjoy it for himself.

Excursions North of Katahdin.

BY GEORGE H. WITHERLE.

Read October 12, 1883.

AT nine A.M., September 16, 1882, the writer and his wife, with Mr. Paul R. Peavey and son of Patten as guides, left Mr. C. R. Patterson's house, on the East Branch of the Penobscot, for a trip up the Seboois River. This house is a mile and a half above the old Hunt place, so long the starting-point for visitors to Katahdin from this quarter, and two miles below the mouth of the Seboois. It is a rough building,

and is the last dwelling on the East Branch. Our conveyance was a canoe and small boat. Low water and a strong and squally northerly wind delayed us, and we camped on the eastern bank, only seven miles from Patterson's, opposite to a steep elevation several hundred feet high, called Peaked Mountain. This stretches for a long distance near the river, with small birches growing where they can get a foothold on its rocky and precipitous sides. The next morning, at half-past eight, we crossed to an old clearing a little above, and ascended the peak by its northern slope, reaching the summit in about an hour and a quarter. We remained there two hours, and obtained a good view of the woods and mountains, with glimpses of the Seboois and of an occasional distant farm. In the afternoon we resumed our course up river; but the low water necessitated so much walking and dragging of our boats that it was not until five P.M. the following day that we reached our destination, about a mile below the mouth of Shin Brook. Here we camped on the west side; and the next morning, ascending the river to the mouth of the brook,—which comes in just below some rough rapids known as Seboois Grand Falls,—we crossed, and visited the Shin Brook Falls, a hard walk of two miles along the steep and thickly overgrown banks of the brook. They are well worth seeing, even at a low stage of water,—consisting of two upper pitches of ten or twelve feet each, and a lower one of forty feet. The gorge below them is very rough, wild, and rocky; and from the top, down the valley of the brook, is a fine view of the Traveller, while to the left the summit of Sugar Loaf overlooks the nearer woods. The forenoon was dark and threatening, with distant thunder, and before we reached shelter heavy showers had given us a thorough wetting.

Five days of rain followed, confining us mainly to our camp and the narrow clearing around it, with occasional short walks in the logging roads in the vicinity; but on the morning of the 25th we found, much to our delight, that the clouds were dispersing and the sun shining through. At nine o'clock we crossed the river to an old landing a little below us, to ascend Sugar Loaf Mountain. This elevation, which rises near the angle formed by the junction of Shin Brook

with the Seboois, is seldom visited. It is very isolated, and therefore, though lower than many others, is visible from a greater distance in several directions. Its height, according to Dr. Jackson, is 1,900 feet. We walked some distance in an old logging road, the bushes and undergrowth thoroughly wet by the rains; then along a line spotted by young Peavey during one of the unpleasant days, and up near the southerly end of the mountain, — a pretty steep climb, — reaching the summit at half-past eleven. We estimated the distance at about two miles and a half. The day was moderate, the thermometer marking 54° at noon. Though a thin haze covered most of the sky, the sun shone through it. The wind was light, and the air quite clear, except in the southeast, where dark clouds obscured the distant view. We looked up and down the Seboois valley, catching glimpses of the river. To the east the pyramidal summits of Chase's Mountain and its outliers rose over the Shin Ponds. Northerly was the pointed top of Mooseleuk and the flatter Munsungun mountains. Northwesterly lay Lake Matagamonsis, with the East Branch valley beyond it, and Matagamon Lake, overhung by the precipitous Matagamon Mountain. Westerly rose the Traveller and the neighboring heights, stretching miles along the river; and southwesterly the Sowadehunk mountains, with Katahdin overtopping them. The summit of Sugar Loaf consists of ledges, very much polished and rounded; bare, except a small scattering growth in crevices and hollows. The sides are steep and precipitous. The lower part is densely wooded; largely with a fine old growth of hard-wood trees, among which we found great quantities of the beautiful maidenhair fern. We spent four hours on the summit, and reached our camp at a quarter-past six. A magnificent golden sunset, which had lighted us through the woods the last part of the way, shone out on us in full splendor when we emerged from them on the brink of the river.

At eight A.M., on the 26th, while the Seboois was still in the shadow of the high bank opposite our camp, we left on our return. Soon after we obtained for a little while a view of the highest peaks of Katahdin, sharply defined in the clear morning light; and the windings of the river gave us an

occasional chance to look back on Sugar Loaf. Thanks to the long rain, we had now abundance of water, and the swift and steady current took us easily down to Patterson's in four and three quarters hours,—less than a third of the time occupied in going up. The Sebcois, as far as we saw it, is a beautiful stream, with much pleasant and some striking scenery, a part of its course being bordered by a fine old growth. I should, however, hardly recommend any one to ascend it at as low a stage of water as when we went up; for we should probably have failed if we had not had very faithful and determined guides.

September 27th we ascended the Hunt Mountain, nearly opposite the Hunt place. This is said to be 1,200 feet high. From the highest summit we had a wide view easterly and down the river; but the western view was hidden by trees. We afterwards crossed two valleys of moderate depth to two more northerly and slightly lower summits. From a tree-top on the northernmost I obtained one of the finest views I have ever had of Katahdin, the Sowadchunk mountains, and the Wassatiquoik valley, which the afternoon light colored with a rich yet delicate brown. The day was mild and sunny,—a model one for wandering in the woods and enjoying elevated outlooks. While at Patterson's at this time we had bright sunsets, calm twilights, and clear moonlight nights, showing the surroundings to the best possible advantage. Before the house is the still river, overshadowed by the woods and by the Hunt Mountain and Lunkasu. Between them Katahdin looks down the Wassatiquoik valley, sharply outlined against the twilight sky, or paler in the moonlight when the frost is sparkling on the slope of the clearing and a few white wreaths of mist rising from the river or among the trees.

September 28th we left for a trip up the East Branch as far as Webster Stream, "carrying" around Bowlin Falls, the Hulling Machine (the roughest and wildest of the falls we saw on the East Branch), Pond Pitch, and Grand Falls. We camped, on the afternoon of the 30th, just above the latter, on the western side, having been informed that here was probably the best starting-point from which to ascend the Traveller. This mountain, with its outliers, extends for

miles along the western side of the East Branch, constituting the finest and most striking feature in many of the views obtained from its shores and waters. We had been unable to learn of any person who had previously made the ascent, though it was supposed to have been climbed by lumbermen and hunters.

At half-past eight A.M., October 1st, taking our tent, blankets, and a few provisions, we followed the driver's path up river a quarter of a mile, through an overgrown lumber landing, and then started into the woods over an old logging road (said to lead to Telos Lake), at first uphill, and then over more level and swampy ground. After considerable reconnoitring, we succeeded in getting a rather imperfect view of the top of the mountain, and turned off the road, spotting our track as we proceeded. Finally we struck another old road, near which we camped about the middle of the afternoon, close to a little brook, on a beautiful bed of moss overlying large flattish rocks. The day, though moderate, was rather cloudy and threatening; but during the night a fresh north-wind, which made our fire smoke badly, dispersed the clouds, and the morning of October 2d dawned clear and windy.

At eight o'clock we left our camp, and again struck into the woods, spotting our track, and keeping, by the aid of compass, the course we presumed the correct one. We passed through some fine hard-wood growth, in the midst of which we came upon a pretty little horseshoe-shaped pond, entirely overshadowed by the trees; through old lumber cuttings; up very steep ascents, where many spruce-trees grew, at first large, but gradually diminishing; over mossy tracts, thickly covering broken rocks; and up and down two or three ravines, getting occasional glimpses and continually broadening views of the country behind us. Soon after half-past eleven we reached a summit, nearly bare. This, as we approached, we were confident was the top of the mountain; but, to our chagrin, it proved to be only an outlying spur, and the mountain itself, steep and thickly overgrown, still towered above us beyond, separated by a deep valley. We solaced our disappointment by a rather scanty dinner; after which, about half-past twelve,

our ignorance of the distance yet to be traversed induced the elder Peavey and my wife to return to camp, while his son and myself went on. We crossed the valley, climbed other mossy and very steep slopes, and gaining another rocky top, which seemed the last, found a still higher one at a considerable distance, separated by a flattish depression much overgrown with scrub, fir, spruce, and birch. We forced our way through this, finding many bear and caribou signs among it, and delaying a little to gather blueberries and cranberries, large and ripe, which grew there abundantly. On gaining the point we aimed at, still another appeared above us, separated, however, by a shorter and less overgrown depression. We reached this at two o'clock, and, to our satisfaction, it proved to be the highest summit.

Here we found a monument of rough stones, supporting a short staff, very mossy, and apparently quite old, the work of some predecessors. During the forenoon the sky had become much clouded, and we had two or three slight snow-squalls. The thermometer stood at 41° , and the wind blew fiercely over the summit, decidedly chilling us after our exertions in climbing. We collected some dry scrub, and with much difficulty succeeded in making a fire in a partially sheltered corner among the rocks. Notwithstanding the clouds, the air was quite clear; spots of sunshine moved rapidly over the landscape; and, after we were partially warmed, lack of time was the main hindrance to our full enjoyment and study of the view. The woods were brightly colored. The valley of the East Branch was at our feet, with the country to the east and southeast stretching far beyond it, and Chase's and Sugar Loaf Mountains, with the village of Patten; northerly, Matagamon Lake, with its precipitous mountain, and the mountains in Aroostook beyond. Northwesterly and westerly lay parts of Chesuncook, Chamberlain, and some of the neighboring lakes. Westerly, near Moosehead Lake (none of which was visible), rose the Spencer mountains and other summits. Southerly, Katahdin and the Sowadehunk mountains cut off the distant view. The northern end of Katahdin extended towards us, hiding the North Basin, but giving a full view of the opposite semicircle of the Great Basin, of Pamola, the

crest, and the highest peaks. Katahdin Lake was partially hidden by Turner Mountain. We had a grand look down into the upper part of the Wassataquoik valley, with Wassataquoik Lake among the woods, and into the valley between Katahdin and the Great Sowadahunk Mountain, and of the curious "Fort Mountain" elevations. On the upper ridge of the Traveller are several projecting, rough, angular, and nearly perpendicular ledges, with a marked, almost vertical, cleavage, and deep and narrow chasms in some places where the layers are separated. Everything has a rough, angular, and broken-up look, contrasting greatly with the rounded forms on the summit of Sugar Loaf.

We left, very unwillingly, after a stop of an hour and a quarter; were lucky enough to hit the end of our "spotted" line at the place where we had dinner; and after a three hours' walk, just as the light in the woods was becoming dim, reached our camp. I should estimate the height of the Traveller at near 3,500 feet, and the distance by our track, from the river to the summit, seven or eight miles. I think we selected the best starting-point, though further exploration would be likely to hit upon a somewhat more direct and perhaps easier course. Should such a one be explored and spotted, as one of the guides proposed, it would add a new attraction to the East Branch, and give comparative facility for ascending the highest and grandest mountain, except Katahdin, near the Penobscot waters.

October 3d we returned to the river, "carried" by the rough Haskell Rock Falls, and camped on the east side, at the foot of Stair Falls. The Traveller was in full view from our camp, and was beautifully lighted up at sunrise the following morning. From this place the river is very circuitous, giving the finest views which we had of the Traveller and neighboring mountains. The woods were richly colored, and many tall old pines were scattered among them. Soon after three P.M. we reached the dam at the foot of Grand or Matagamon Lake. A fresh and squally north-wind was blowing, raising quite a heavy swell, and spotting the lake with white caps, so that we hesitated about crossing. But we found that our craft rode the seas well; the breeze moderated; with some diffi-

culty we found the inlet, and at sunset reached the floating-bridge over which passes the road from Trout Brook Farm to Patten. The mile and a half from the river to the farm was very wet, and the walk over it in the fading twilight grew wearisome before we reached the buildings, which are hidden and sheltered on the north by a rocky knoll covered with trees. On the south the clearing, a hundred acres in all, extends a long distance up the side of a high hill, giving a pleasant and extensive prospect from the upper part. Here we had comfortable quarters for the night.

The next forenoon we resumed our voyage up the still and winding "thoroughfare" leading to Second, or Matagamonsis, Lake. This lake, though without striking features, is very beautiful, with several small rocky islands, clean, wooded shores of a moderate height, and views of the mountains in the south. Having crossed it, and re-entered the East Branch, — now very much reduced in size, — we passed the mouth of Webster Stream, and at four P.M. reached our terminus, the Webster Carry, and camped on the west side of the river. Thoreau, in his "Allegash and East Branch," speaks of several parallel, steep, rocky ridges traversing the country in this vicinity. On the summit of one of these, east of the river, from the top of a small tree near a clump of tall Norway pines, I enjoyed a beautiful view of a great extent of forest, — the portion near the streams mostly small birch of various shades of green and yellow, with some groves of pine of moderate size, — also of the mountains at various distances, and of a part of the lake, all lighted and richly tinged by the low sun. This was one of the pleasantest of days, — clear, with light breezes and a few fleecy clouds, the thermometer registering 60°.

The night was still, with bright starlight and rapidly changing and intensely brilliant Northern Lights. As it advanced cold seemed to be dropping down on us out of the sky. Our wood gave little heat, being mostly green poplar, and it was with some misgivings that I finally about midnight lay down to sleep. In the morning I found that the thermometer had fallen to 25°, and the water in a pail by the side of our tent, and six feet from the fire, frozen so solidly that it

was hard work to break it. As the sun rose it rapidly warmed the air, and at noon the temperature had again risen to 61°. We crossed the carry, visited the picturesque falls on Webster Stream, and climbed the highest of the rocky ridges near it, from which was a view of the woods, lake, and mountains, superior, if possible, in beauty and richness of color to that obtained the previous day.

In the afternoon we reluctantly left, and, descending the river, camped on the eastern side of the Matagamonsis Lake, about a mile from the outlet. Thoreau mentions that he found on islands in the Matagamon a few of the Labrador or gray pines. When we landed at our camp-ground I noticed, on a little point near by, a pine of peculiar appearance, about forty feet high, and nearly two feet in diameter at the butt. Upon examination it appeared to correspond to the description of that species; and I found there a considerable number of the same sort, of various sizes, sprinkled among the other growth, a large portion of which was pine, mostly Norway, old but slender. When we returned over Matagamon I observed a few also on the islands there. I have never noticed it previously, — perhaps because my attention has not been attracted to it, — and have not seen it referred to as growing in the woods of Maine, except by Thoreau.

Early on the morning of the 7th I went to the shore to look around on the lake in the twilight. The water was glassy, with a few light fog-wreaths rising here and there. A few fleecy clouds in the east were beginning to color slightly; near them I was surprised to see a conspicuous comet. As we were starting for the day a rainbow appeared in the west, soon followed by a slight shower, the first for twelve days. The clouds were dark and threatening, and a storm seemed near at hand. But soon after entering the Matagamon the indications became more favorable; and landing on the western shore, and sending young Peavey ahead to the dam to prepare our camp for the night, at half-past twelve I started alone to climb the Matagamon Mountain.

The ascent began near the shore, was very rough and steep, and much obstructed by windfalls. I crossed two deep ravines, — not having chosen the best starting-point, — and

in an hour and a quarter reached the bare ledges overlooking the lake. The actual summit, a little higher, is covered with trees, and somewhat back from the water. It was windy and quite cloudy, with spots of sunshine; the distance hazy, but nearer views distinct. The lake and islands were below me, and the view of Sugar Loaf, beyond them, was the best I had obtained. Parts of the winding course of the East Branch were in sight, and a long stretch of its valley sloping up grandly towards the Traveller and its companions. The woods were at their brightest, — patches of flaming red among intermingling shades of yellow, green, and orange, and the dark evergreens. With such a light as that of the previous day, the landscape in beauty and richness would have surpassed even that seen near Webster Stream. Remaining about an hour and a quarter, I descended in an hour, and we paddled to the dam, where we found abundance of dry drift-wood, and passed a night even uncomfortably warm.

The next day, the 8th, we continued our course down river. It was the warmest during our trip, the temperature rising to 78°. At three P.M., on the 9th, we reached Mr. Patterson's. On the 10th we descended the river to Medway, the point where the two branches of the Penobscot unite. There the landlady of the hotel — whether impressed by our dilapidated condition or by the nature of our baggage — replied to our call for rooms with the question, "Is it a show?" Here also we got our first general information about outside affairs, and saw our first newspaper for twenty-six days. Long-continued good weather, the autumn foliage in its highest beauty, and excellent guides, gave us an opportunity of enjoyment perhaps more favorable than the average; but no narrative which I have read has done full justice, in my judgment, to the interesting features of this East Branch trip.

Notes on the Cryptogamic Flora of the White Mountains.

BY W. G. FARLOW.

THE somewhat scanty phænogamic alpine flora of New England has been well studied; and, from the time when Pursh explored the White Mountain range to the present day, numerous collectors have visited the higher peaks and ravines, and it is probable that few novelties remain to be discovered. With regard to the Thallophytes, however, with the exception of the lichens very little is known. The lichen flora has been most carefully studied by Professor Tuckerman, and the results have been embodied in his writings, of which the most recent is the Synopsis of North American Lichens. With regard to the fungi and algæ, practically nothing has been published, except now and then scattered references in the botanical journals to specimens hastily snatched by some tourist in scrambling down the Mt. Washington path. It might be expected, however, that the alpine and subalpine species of New England would be similar to those of the Adirondacks, which have been studied by the State Botanist of New York, Mr. C. H. Peck, whose results have been made public in a pamphlet, "Plants of the Summit of Mt. Marcy," and in the annual Reports of the New York State Museum.

With the view of ascertaining whether the species of *Peridermium* known in the Adirondacks occurred also in the White Mountains, and, if so, of determining their relative distribution, I spent a part of August and September, 1882, and a few days in September, 1883, at Shelburne, from which point I made several excursions to the higher summits and ravines. Unfortunately in both years the drought was excessive, and fungi and algæ were few and in poor condition on the lower mountains, and, as is always the case, collecting on the summits was difficult and expensive. The following list includes the principal forms collected in the vicinity of Shel-

burne and on Mts. Washington, Adams, and Madison. I made also three trips to Tuckerman's Ravine, and two to King's Ravine, both excellent localities for fungi; but for a satisfactory exploration one should camp in the ravines several days, instead of making hasty trips, as I was obliged to do.

Many tourists and all botanists visit Tuckerman's Ravine, but few botanists have ever collected in King's Ravine, which, from its remoteness and wildness, might be expected to present a rich field for botanical exploration. Every one who is familiar with the mountain flora knows the treasures of Tuckerman's; *Salix herbacea*, *Oxyria digyna*, *Gnaphalium supinum*, abundant near the snow arch, with the masses of *Castilleja pallida* and *Arnica mollis* passing upwards to Bigelow's Lawn with its rare *Ericaceæ*. No more brilliant display of color can be imagined than was to be seen on September 6, 1882, when the ledges were fairly covered with huge tufts of *Arnica* and *Castilleja* interspersed with the white spikes of *Habenaria dilatata* and the heavy umbels of *Archangelica Gmelini*.

King's Ravine, on the other hand, is disappointing to the botanist, judging from my own experience. The alpine phænogams are by no means so abundant as in Tuckerman's Ravine, and, as far as I could judge, the species were all those common in Tuckerman's without some of the rarer species of the last-named locality. Fungi and lichens abound, as might be expected from the constant dampness. Of the lichens found in King's Ravine, I need only mention *Buellia pulchella* (Schrad.), not uncommon on boulders but sterile as in other parts of the mountains; *Cystocoleus rupestris* (Pers.) Thw., common in hollows in the rocks; *Calicium roscidum* var. *trabellinum* (Nyl.), abundant on rotting trunks of *Abies balsamea*; and *Bæomyces placophyllus* (Fr.), on moss-covered rocks at the point where the brook issues from the boulders. The floor of King's Ravine, meaning by that expression the portion occupied by the large boulders, is perhaps somewhat more alpine in character than the lower part of Tuckerman's Ravine, as shown by the presence in considerable quantity of *Diapensia Lapponica*, *Rhododendron Lapponicum*, *Cassiope*

hypnoides, *Loiseleuria procumbens*, and the lichens *Buellia geographica*, *B. pulchella*, *Lecanora ventosa*, *Thamnolia vermicularis*, *Cetraria nivalis*, and other species. The dark, gloomy forest between the entrance of the Ravine and the path to the Adams Camp, passing through what is called the Vale of Shadows, appeared to be rich in *Polyporei*; but lack of time prevented my examining carefully this region. One of the striking fungi of this tract is *Polyporus borealis*, a species which shrinks very much in drying and is not easily recognized from herbarium specimens.

Of the peaks adjoining King's Ravine, I explored the part of Mt. Madison towards Adams and the depression between the two mountains, including Madison Spring and Star Lake and both slopes of Mt. Adams, as far as the Peabody Spring and the borders of Mt. Jefferson. The flora is similar to that of Mt. Washington, but less varied; and one who wishes to get a good view of our alpine flora in a short time should not be tempted to go to the northern peaks. Here, as in other parts of the mountains, one is surprised at the abundance of *Veratrum viride*, which, seen from a distance, is the most striking plant of the grassy slopes of Madison and Adams. The water of Star Lake is very shallow and clear, and the only alga found at the time of my visit was a sterile *Zygnema*, which covered the stones in large quantity. The marshy ground near the lake was for acres covered with *Eriophorum alpinum*.

Of the lower mountains which I was able to explore, I would mention Mt. Moriah, Bald Cap, and Mt. Success. They are not much visited now, except by persons spending the summer at Shelburne. Mt. Moriah is densely wooded, except a small area at the summit, where a few subalpine species of no special interest are found. The locality is, however, a good one if one wishes to collect *Peridermium abietinum* and *Calypsotheca Goeppertiana* without camping out over night, or stopping at one of the large hotels, as a satisfactory trip may be made in a day from Shelburne or Gorham. Bald Cap is entirely destitute of any strictly alpine vegetation, and, apart from its picturesqueness, is only of interest as being the nearest peak to Shelburne, where the botanist will

find a tract which may be described as the region of *Cetraria Oakesiana*. After passing over two lower summits a ridge is reached which is covered with different species of *Abies*, on whose trunks the *Cetraria* grows luxuriantly. The flora at this the highest part of the mountain is similar to that of the Vale of Shadows. The picturesque lake in a depression of this ridge is very shallow, and at the time of my visit contained nothing but *Batrachospermum vagum* and large quantities of what appeared to be a sterile *Zygogonium*. Mt. Success, as it is called by the inhabitants of Shelburne, is, I believe, called Ingalls Mountain on the charts of the Coast Survey. After a long and tedious walk through a pathless forest one reaches the summit, which is a flat expanse of sphagnum turf and dwarf *Vaccinium* bushes of several species, only interesting for the growth of *Rubus Chamæmorus*, which is found in but few localities in the White Mountains. In descending the mountain I followed the bed of Ingall's Brook, one of the most beautiful streams of the region, and in some places fairly carpeted with the beautiful lichen *Hydrothyria venosa*, which as seen at the bottom of clear pools cannot fail to remind a marine algologist of the darker-colored species of *Nitophyllum* of the ocean.

ALGÆ.

At the date of my visit to the mountains, the drought was so great that all the smaller brooks and pools were dry; and consequently but few species of algæ were collected, most of which belong to the *Phycochromaceæ*. I visited the Lake of the Clouds, and found it at the time, the first week of August, singularly destitute of aquatic vegetation. The water in both of the two sheets which form the so-called Lake was quite clear, without even the ordinary *Zygnemereæ*, and there was no trace of the *Isoëtes* which has at times been found there. At the outlet, however, the stones were covered by a very large quantity of the lichen *Ephebe pubescens*. The Flume was a much more promising locality for algæ, but unfortunately my visit was very short and during a pouring rain.

SYNECHOCOCCUS ÆRUGINOSUS Naeg.

Moist rocks at the Flume. Lake Willoughby.

GLEOCAPSA MAGMA Kg.

Common on wet stones at the top of Cabot Mountain, Shelburne.

GLEOCAPSA DUBIA Wartm.

On rocks mixed with lichens and *Stigonema ocellatum*. Flume.

Also Cabot Mountain, Shelburne.

NOSTOC RUPESTRE Kg.

On rocks. Flume.

N. MUSCORUM Ag.

On mosses. Berlin Falls.

N. MACROSPORUM Menegh.

Mixed with other algæ. Flume. Shelburne. Lake Willoughby.

OSCILLARIA TENUIS Ag.

On mosses. Mill Brook. Shelburne.

LYNGBYA VULGARIS Kirch. (*Phormidium vulgare* Kg.)

On mosses. Berlin Falls.

MICROCOLEUS VERSICOLOR Thuret.

Berlin Falls. Mt. Tumble-down Dick.

TOLYPOTHRIX PENICILLATA Thur.

On submerged mosses. Mill Brook. Shelburne.

SYMPHYOSIPHON HOFFMANNI Kg.

On rocks near the Brook. Tuckerman's Ravine.

STIGONEMA OCELLATUM Thuret. (*Sirosiphon* Kg.)

Common on the wet rocks of the Flume and Berlin Falls.

STIGONEMA MAMILLOSUM Ag.

On submerged stones in the Androscoggin River. Shelburne.

STIGONEMA SAXICOLUM (Naeg.)

Exposed rocks and on *Stereocaulon*. Top of Cabot Mountain. Shelburne.

The *Sirosiphon pulvinatum* Desm. Crypt. France, no. 138, which must be included under lichens rather than algæ, is common in several localities, as Berlin Falls, Crow's Nest, and Tumble-down Dick.

FISCHERIA THERMALIS Schwab.

On stones in damp woods. Shelburne. Lake Willoughby.

This species is common on stones in the White Mountain region as well as in Vermont. I at first supposed the species to be new, but European botanists to whom specimens were sent are inclined to think that it is either *F. thermalis* or else closely related to it. I have myself no authentic specimen of that species with which to compare it, and although the habitat is different from that of *F. thermalis*, our species may, for the present at least, be called *F. thermalis* var. *Americana*.

SCHIZOGONIUM MURALE Kg.

Rocks in the Brook below King's Ravine. This was found in very long tufts in rather deep water. It is usually found in short tufts and on wet ground and walls rather than submerged.

TRENTEPOHLIA AUREA (L.) Martius.

On rocks with *Stig. ocellatum*. Flume and other localities.

TRENTEPOHLIA IOLITHUS, (L.) Wittr.

On bark of *Abies balsamea*, King's Ravine.

This species is usually found on rocks, while the common European form, an *Abies*, is *T. abietina* (Rab.). A microscopic examination of the plant from King's Ravine, however, shows that it corresponds perfectly with no. 41 of Wittrock and Nordstedt's *Alg. Scand.*, and is not at all like the types of *T. abietina* in *Alg. Sachs.*, nos. 122 and 658, so that, in spite of the habitat, this must be considered to belong to *T. Iolithus*. On the other hand, a form not uncommon on the under side of shelving rocks in King's Ravine, approaches closely to *T. abietina*, to which it may be referred with a considerable degree of certainty.

DRAPARNALDIA GLOMERATA Ag.

Ditches. Shelburne.

LEMANEA TORULOSA Ag.

Mill Brook. Shelburne.

BATRACHOSPERMUM VAGUM Ag.

Outlet of lake on Bald Cap. Shelburne.

FUNGI.

The following enumeration includes a portion of the species collected in 1882 and 1883, and there still remain some undetermined forms. Of the pileate *Hymenomyces* but few species were found, owing to the drought. As there is no attempt made to classify the species, except in a general way, the more common names of some of the secondary forms have been retained, and mycologists will have no difficulty in referring them to the species to which they are supposed to belong. The list shows that the species of the White Mountains are essentially those found also in the Adirondacks, and, to a large extent, identical with alpine or arctic European species. A few new species are described, and some details of the rarer or doubtful forms are given. Evidently the alpine and subalpine regions of the White Mountains afford a fine field for exploration to mycologists, and one who could camp out for some time in the different ravines would be amply rewarded. Both my visits were unfortunately made at the same season of the year, and without doubt an exploration in June and July would furnish a very different list of species.

TILMADOCHÉ MUTABILIS Rost.f.

On wood. Shelburne.

T. NUTANS (P.) Rost.f.

On moss. Shelburne.

T. GRACILENTA (Fr.) Rost.f.

On dead *Abies* trunks. Lead Mine. Shelburne.

CHONDRIODERMA GLOBOSUM (P.) Rost.f.

Shelburne.

DIDYMIUM FARINACEUM Schrad.

Shelburne.

DIACHÆA LEUCOPODA (Bull.) Rost.f.

On sticks. Shelburne.

STEMONITIS FUSCA Roth.

Common on trunks.

S. FERRUGINEA Ehr.

Common on trunks.

ARCYRIA PUNICEA P.

Common on trunks.

A. INCARNATA P.

On trunks.

A. NUTANS (Bull.) Grev.

On trunks. Shelburne.

HEMIARCYRIA CLAVATA (P.) Rost.f.

On trunks. Shelburne.

TRICHIA CHRYSOSPERMA (Bull.) DC.

On logs. Shelburne.

PERONOSPORA GRISEA (Ung.) De Bary.

On leaves of *Veronica alpina*. Top of Tuckerman's Ravine.

P. ALTA Fuckel.

On leaves of *Plantago major*. Shelburne.

ENTYLOMA COMPOSITARUM Farlow ad int.

"Conidia fusiform or slightly clavate, often curved, 15–20 μ long by 2–3 μ broad. Spores globose or somewhat angular, about 7.5–11.5 μ in diameter; wall thin and nearly colorless." — *Bot. Gaz.*, Aug., 1883.

On *Aster puniceus*. Abundant in the upper part of Tuckerman's Ravine.

ENT. LOBELIÆ Farlow.

"Conidia narrowly fusiform, 10–25 μ by 2–3 μ . Spores light-colored, globose or slightly angular, thin-walled, 8–15 μ in diameter, average 7.5–11.5 μ ." — *Bot. Gaz.*, Aug., 1883.

On leaves of *Lobelia inflata*. White's Brook, Gilead, and several localities in Shelburne.

This species was first found at Gilead in 1882, and in 1883 it was found also at Shelburne. It has also been discovered recently in Massachusetts.

DOASSANSIA (?) EPILOBII Farlow.

Spores densely packed in globular or lobulated masses which are 80–200 μ in diameter. Spores irregularly polyhedral, approaching globular, 7.5–17 μ in diameter, average 10–12 μ ; cells of external layer blackish brown, thick-walled, outer surface cuticularized; internal spores lighter-colored, with thinner walls.

On leaves of *Epilobium alpinum*. King's Ravine.

This curious fungus was found on *Epilobium*, growing on the borders of the torrent which falls from Mt. Adams into King's Ravine. Some of the leaves were also affected with *Aecidium Epilobii*; and when first collected the *Doassansia* was mistaken for *Puccinia Epilobii*, which, to the naked eye, it closely resembles when fresh. A description was given in the "Botanical Gazette" of August, 1883; but at the time of writing, the description of Cornu's new genus *Doassansia* had not been seen. The present form is evidently nearly related to *D. Alismatis* Cornu, but the outer layer of cells enclosing the spores is not so well marked. In 1883 I did not visit King's Ravine, nor was I able to find the fungus in Tuckerman's Ravine, although the *Epilobium* is abundant there. The season was, however, late, and most of the plants had been killed by frost. It is to be hoped that any one who is so fortunate as to find this fungus will be able to watch the mode of germination of the spores.

USTILAGO NEGLECTA Niessl.

In the ovaries of *Setaria glauca*. Shelburne.

U. UTRICULOSA Tul.

On the inflorescence of *Polygonum Pennsylvanicum*. Shelburne.

U. SEGETUM (P.).

Common on oats and barley throughout the whole region.

AECIDIUM CLEMATIDIS DC.

On *Clematis Virginiana*. Shelburne.

AEC. THALICTRI Grev.

On *Thalictrum Cornuti*. Tuckerman's Ravine.

AEC. GROSSULARIÆ DC.

Abundant on *Ribes prostratum*. At the head of King's Ravine.

AEC. EPILOBII DC.

On *Epilobium alpinum*. King's Ravine.

PERIDERMIIUM BALSAMEUM Pk.

On leaves of *Abies balsamea*.

P. ABIETINUM (A. & S.).

On leaves of dwarf *Abies nigra*.

P. PECKII Thuem.

On leaves of *Abies Canadensis*.

The *Peridermia* are nothing more than æcidia with long peridia, which are parasitic on *Coniferae*. The three forms just mentioned are interesting in several respects. Knowing that they occurred in

the Adirondacks, I presumed that they would also be found in the White Mountains; and the main object of my trip was to ascertain their comparative distribution, and their proximity to certain teleutosporic forms on *Ericaceæ*. A fourth form is found in New Hampshire and Vermont, *Aec. elatinum* A. & S., to which I shall refer later on; but it was not found by me in the mountain region. Of the three forms mentioned, *P. abietinum* is confined to the higher mountains, being found in great abundance on *Abies nigra*; *P. balsameum* infests *Abies balsamea*, and extends from an altitude of about 4,000 feet to the level of the Androscoggin; and *P. Peckii*, which attacks *Abies Canadensis*, is confined to the base of the mountains. Every one who has climbed any of the higher mountains will recollect, with anything but pleasure, the entangled growth of dwarf *Abies nigra* which forms a belt just below the region of bare rocks. It is in this dwarf growth that *P. abietinum* abounds on all the mountains I visited, namely, Washington, Adams, Moriah, and Success. I first found the æcidia in King's Ravine in the third week in August, when the peridia were just opening; but the fungus does not attain perfection until two or three weeks later, and it was so abundant on Moriah and Success in the third week in September that, in attempting to penetrate the thicket, I was completely covered by the cinnabar-colored spores which were discharged in showers. Nearly every leaf on the smaller branches is attacked by the fungus and discolored. It is not to be supposed that the fungus attacks the larger trees of *Abies nigra* lower down on the mountains at an earlier date, and that what I saw was only the later development nearer the summit. The change is not gradual; but one comes suddenly upon immense quantities of the *Peridermium* as soon as the dwarf form of the *Abies* is reached. I am unable to distinguish this *Peridermium* from the *P. abietinum* (A. & S.) of Europe as seen in Fung. Eur., no. 1676, which is considered to be the æcidium of *Chrysomyxa Rhododendri* (DC.). Of the original *Aec. abietinum* (A. & S.), two forms have been in later times recognized as stages of *Chrys. Rhododendri* and *Chrys. Ledi*, respectively. The two forms are distinguished by slight differences in the peridial cells, difficult to recognize in dried specimens. As already remarked, our form resembles very closely no. 1676, Fung. Eur., which is cited by Winter as belonging to *Chrys. Rhododendri*. Our form was called by Peck *P. decolorans*, in the twenty-seventh Report of the New York State Museum, and later it was called *P. abietinum* var. *decolorans* in Thuemen's "Blasenrost-Pilze der Coniferen." I examined with great care the *Rhododendron Lapponicum* and *Ledum latifolium* near the dwarf spruce, but found no trace of *Chrysomyxa*. My search was so thorough that I think it safe to say that at that date there was no *Chrysomyxa* on any of the *Ericaceæ* in the localities examined. An examina-

tion at another season of the year might have given a different result. A *Uredo Ledicola* has been described by Peck on *L. latifolium* on Mt. Marcy in the Adirondacks, which he considers to be different from *U. Ledi* (A. & S.), now referred to *Chrysomyxa*. In "Grevillea," iii. 54, Berkeley and Curtis have described a *Puccinia Ledi* from New Hampshire, C. J. Sprague; but unfortunately there is no specimen in either the Curtis collection or the Sprague collection from which to ascertain the exact locality or the possible relation to *Chrys. Ledi*.¹ *Calyptospora Goeppertiana* was found in the neighborhood; but, as will be seen, it extended far beyond the limits of *P. abietinum*. As far as the distribution is concerned, that of the dwarf *Abies nigra* corresponds more nearly to that of the *Rhododendron* than to that of the *Ledum*. The latter, although found high up on the mountains, attains perfection lower down, and is common at a distance from the mountains, while the *Rhododendron* is strictly alpine, occurring with the dwarf spruce and somewhat higher. *P. abietinum* is not known by me to occur with certainty beyond the regions indicated. A *Peridermium* was collected by Mr. H. M. Seely at Fairhaven, Vt., in June, 1883; but although it, to a certain extent, resembles *P. abietinum*, I am not able to speak with certainty from the material sent. It occurred on low grounds near *Ledum*, and may possibly be the other form associated with *Chrys. Ledi*. In short, the *Peridermium* on dwarf *Abies nigra* does not seem to me to be distinct from *Aec. abietinum* (A. & S.), which includes two forms, our form being rather nearer the one associated with *Chrysomyxa Rhododendri*. Furthermore, the distribution of dwarf *Abies nigra* corresponds to that of *R. Lapponicum*, so that one would naturally look for a teleutosporic form on that host. On the other hand, it must be said that a *Uredo* and *Puccinia* on *Ledum* have been described in this country; but, as far as I know, no corresponding species have yet been noticed on *Rhododendron* in the mountainous regions of New England or New York.

P. balsameum, although common enough in Shelburne, reaches its best development higher up on the mountains, in depressions where *Sphagnum* is abundant. The species is also known to me from Vermont, where it was collected by Prof. Brainerd and Mr. Seely; from the northern shore of Lake Superior, Prof. W. R. Dudley; and Gaspé, Canada, Prof. J. Macoun, not to mention the stations in the Adirondacks. The leaves affected turn yellow or whitish, giving a pretty variegated appearance to the foliage. The peridia are cylindrical and generally short; and I can confirm the statement of Peck

¹ In a note Mr. Sprague informs me that the specimen was collected about thirty years ago, during a trip to Mt. Washington; but he does not recollect the exact locality where the *Chrysomyxa* was found.

that the spores, even when fresh and in perfect condition, are nearly white, with scarcely a tinge of red or yellow. The species certainly is very near *Aec. columnare* (A. & S.), and our specimens can hardly be distinguished from Klotzsch Fung. Eur., no. 1876. Whether the shorter peridia and white spores are sufficient to distinguish our form specifically, is a question which I should not care to answer without having seen living specimens of the European *Aec. columnare*. The latter is supposed to be the æcidium of *Calypsozona Goeppertiana*, an easily recognized parasite on *Vaccinium Vitis-Idæa*. In this country the *Calypsozona* has been known for some time on *V. ovalifolium* in the West, and it has been seen on *V. corymbosum* in one instance near Boston, and has been found by Professor Jesup to be common on that host at Hanover, N. H., on the Connecticut. I found it common on *V. Vitis-Idæa* on all the mountains I visited, on *V. Canadense* on the Cherry Mountain Road, and on *V. Pennsylvanicum* on Mts. Moriah and Success. On ascending Mt. Moriah I watched carefully for the first appearance of *Calypsozona*, and when about half-way up the path passed through a large patch of *V. Pennsylvanicum* badly affected by *Calypsozona*; and on the same spot were found, for the first time, young trees of *Abies balsamea* covered with *Peridermium balsameum*, but no *P. abietinum* was seen until the summit was reached, where both the *Peridermium* and *Calypsozona* were found, the latter on *V. Vitis-Idæa*, which replaces *V. Pennsylvanicum* near the summit. In short, it can be said of our *Peridermium balsameum* that it closely resembles in most respects the æcidial form of *C. Goeppertiana* of Europe, and that not only in the White Mountains, but also in other parts of the country, there seems to be a parallelism between the distribution of the *Peridermium* and the *Calypsozona*. The sporadic case of the *Calypsozona* near Boston is exceptional, as no *Peridermium* except *P. Pini* is known in that region.

Of the third species, *P. Peckii*, I have but little to say. I have only found it at Shelburne, where it grew on *Abies Canadensis* in damp places. It is perhaps unnecessary to say that it grew near *Ericaceæ*, for anything else would be difficult in a region so rich in plants of that order. The species with which it was usually associated were *Rhodora Canadensis*, *Cassandra calyculata*, *Andromeda ligustrina*, and the common lowland *Vaccinia*, on all of which grew in abundance the very common uredo, which, for want of a better name, may be called *U. Vacciniorum*, but which, as it is found throughout the whole country, can have no special significance in this case. *P. Peckii* differs from *P. balsameum* in having longer, slender peridia and spores of a light-orange color, and it like *P. balsameum* resembles *Aec. columnare* of Europe. In spite of their evident relationship I should hardly consider the forms on *A. balsameum* and *A. Canadensis* as specifically the same. I have already con-

sidered the question of the identity of *P. balsameum* and *P. columnare* in the light of their distribution; and for a comparison of the last-named species with *P. Peckii* we have not yet sufficient data. Peck mentions *P. columnare* on *Abies Canadensis* in his twenty-eighth Report. Whether or not is meant by this the same species as was named by Thuemen *P. Peckii*, I do not know, but suspect that such is the case.

A fourth species, *P. elatinum* (A. & S.), already known in New York, occurs in Vermont and New Hampshire, and extends as far as Gaspé, Canada, where it was collected by Professor Macoun. The earliest discovery of this species in America was, as far as I can ascertain, by Mr. C. J. Sprague, by whom it was found in New Hampshire in 1856; and apparently at about the same date it was found by Mr. T. P. James near the White Mountains. I have received beautiful specimens from Professor Brainerd, collected at Ripton, Vt. The fungus distorts the smaller branches, usually attacking all the leaves of a branch, making them stouter and fleshier than usual, and of a yellowish color. The distortion of the branches forms the *hexen-besen* of the Germans.¹

UROMYCES LILIACEARUM Ung.

On *Lilium Philadelphicum*. Near the Androscoggin. Shelburne.

The uredo was found as well as the teleutospores, in August, 1883.

U. HYPERICI (S.).

On *Hypericum* sp. Shelburne.

PUCCINIA ASTERIS Duby.

Common on different species of *Aster*.

P. MESOMEGALA B. & C.

On leaves of *Clintonia borealis*. Bald Cap and Cabot Mountains. Shelburne.

In spite of the abundance of *Clintonia* in the mountains, the *Puccinia* is apparently not very frequent, although when found at all, it is abundant. I could see no direct connection between the altitude and the distribution of the fungus, which seems, on the whole, to prefer the foot-hills rather than the higher peaks.

P. PORPHYROGENITA Curtis.

On leaves of *Cornus Canadensis*. Shelburne, occasionally, and common on the mountains.

¹ In this connection I would state that *Coleosporium Senecionis* (P.), whose æcidium is said to be *Peridermium Pini*, has recently been found by Prof. W. W. Bailey near Providence, R. I. The *Peridermium* has been seen near Boston and at Lunenburg, Mass.; but although I have carefully searched for the *Coleosporium* on *Senecio vulgaris*, I have never found it near Cambridge. A *Chrysomyxa*, which I cannot distinguish from *Chrys Abietis* (Wallr.), was found by Mr. A. B. Seymour on *Abies Canadensis* at Chebacco Lake, Essex Co., Mass., in June, 1883.

This beautiful species may be said to be characteristic of the mountain region of New England, although it has a wide range. It is found in small quantities on the hills of Shelburne, and it becomes common in the belt of firs and spruces on the mountains, especially in the vicinity of King's and Tuckerman's. It is often accompanied by *Glomerularia Corni* Pk. on the leaves, and on the stems by an *Erineum*, which, as far as I can ascertain, has not been described.

P. BISTORTÆ (Strauss).

On *Polygonum viviparum*. Alpine Garden, Mt. Washington.

This species, I believe, has not previously been reported in the United States.

P. VERATRÆ Duby.

On *Veratrum viride*. King's and Tuckerman's ravines.

P. CIRCÆÆ P.

Everywhere common on *Circæa alpina*.

P. GALIORUM Lk.

On several species of *Galium*. Shelburne.

P. RUBIGO-VERA (DC.).

Common on barley. Randolph.

TRIPHAGMIUM CLAVELLOSUM Berk.

On *Aralia nudicaulis*. Mts. Adams, Washington, Moriah, and Success.

This beautiful species is characteristic of the mountain flora, not occurring in the lowlands, where the *Aralia*, however, abounds. It is common in the forests of deciduous trees on all the mountains I have explored; but I failed to find it below an altitude of 1,500 feet, nor does it extend high up on the mountains. In attempting to ascertain the æcidial condition, one should bear this fact about the distribution in mind. As I have never visited the region in the season when æcidia are most frequently found, I am unable to surmise with what form the *Triphagmium* may be associated.

MELAMPSORA EPILOBII (P.).

On leaves of *Epilobium angustifolium*. Shelburne and Jefferson.

M. (CALYPTOSPORA) GOEPPERTIANA (Kühn) Wint.

On stems of *Vaccinium Vitis-Idæa*, *V. Pennsylvanicum*, and *V. Canadense*. Mts. Washington, Adams, Moriah, and Success.

SPHEROTHECA EPILOBII (Lk.).

On leaves of *Epilobium alpinum*. Tuckerman's Ravine.

S. PANNOSA (Wallr.) Lev.

On leaves of *Rubus triflorus*. Shelburne.

HELVELLA LACUNOSA Afz.

On moss. Shelburne.

VIBRISSEA TRUNCORUM (A. & S.) Fr.

Common on partly submerged sticks in mountain brooks.

This species, which is seldom found in the lowlands of New England, is a common and characteristic species in cold brooks, and is especially abundant along the torrents which fall into King's and Tuckerman's Ravines.

SPATHULARIA VELUTIPES Cooke & Farlow.

On mossy trunks in damp woods.

This species is common in the region of the White Mountains, and Lake Willoughby, Vt., and has been found also in other States. It has generally been named by American collectors *Spathularia flavida*, but it differs widely from that species. The substance is firm and even tough, and specimens shrink comparatively little in drying. The fungus is seldom more than two inches high, and the stipe is of a dark velvety brown, while the hymenium is somewhat yellow, but never of the bright yellow color of *S. flavida*. A description was given in Grevillea, September, 1883.

PEZIZA CEREAE Sow.

On moss. Shelburne.

P. AGASSIZII B. & C.

Common on trunks of *Abies*.

P. SCUTELLATA L.

Common in damp woods.

PSILOPEZIA NUMMULARIA Berk.

On partly submerged logs. Shelburne.

TYMPANIS PINASTRI Tul.

On bark of *Abies balsamea*. Mt. Moriah.

PHACIDIUM VACCINII Fr.

On leaves of *Vaccinium Vitis-Idæa*. Tuckerman's Ravine.

PHAC. CORONATUM Fr.

Very common on fallen leaves of birch, poplar, and oak.

PROPOLIS CIRCULARIS Farlow.

Apothecia numerous, aggregated, circular, and perforated in the centre. Disk yellowish brown, slightly concave. Asci oblong, or subcylindrical, 60–80 μ long by 7.5–11.5 μ broad. Paraphyses filiform, swollen at the tip, occasionally branching. Spores 8, colorless, contents oily, monostichous, navicular, sometimes slightly curved, 19–21 μ long, by 3.8–5.5 μ broad.

On sticks. Bald Cap. Shelburne.

STICTIS TSUGAE Farlow.

Hypophyllous, scattered, disk minute, circular, dark brown, raised above the epidermis, which is ruptured and turned to one side. Asci oblong, 55–65 μ long by 11–12 μ broad. Paraphyses straight, filiform, clavate and brown at the tip, about 3 μ in diameter. Spores 8, white, ovate, two-celled, one cell being much larger

than the other, constricted at the septum, 13–15 μ long by 6–7.5 μ broad.

On leaves of *Abies Canadensis*. Shelburne.

This fungus appears only on the under side of the leaves, which turn brown and quickly fall. It was first noticed in August, 1882, on a tree affected with *Peridermium Peckii*. In September, 1883, it was found on a large number of trees, and had nearly destroyed the foliage. It may be considered a disease which does considerable harm. The fungus bursts through the epidermis in such a way that the latter is usually torn and pushed to one side in the form of a scale.

STICTIS HYSTERINA Fr.

Common on smaller dead branches of *Pinus strobus* and also on *Abies balsamea*. Shelburne.

This species has long been known in the United States, but I have seen no full account of the fruit. Prof. T. M. Fries, who has examined specimens collected at Shelburne, informs me that they agree with the type in his father's collection. The apothecia are lanceolate and arranged generally parallel to the axis of the branch. The asci are clavate or saccate, 45–57 μ long by 15–22 μ broad; paraphyses 1.5 μ in diameter, filiform, flexuous, brownish at the tip. Spores 8, white or pale yellow, often guttulate, ovate in outline, muriform, 15–22 μ long by 7.5–11.5 μ broad, usually distichous. The species appears to be not uncommon in lower New England, and is not confined to coniferous wood, but is found on posts and rails. I am unable to distinguish from the present species, except by its smaller apothecia, the specimen on *Nyssa* in Ellis's North American Fungi No. 571, *Hysterium stictoides* C. & E.

HYSTERIUM SPHERIOIDES A. & S.

On leaves of *Ledum latifolium*. King's Ravine.

To this species probably belongs an immature form found in August, 1882.

H. DEGENERANS Fr.

On twigs of *Vaccinium uliginosum*. King's and Tuckerman's ravines.

H. PINASTRI Schrad.

On leaves of *Pinus strobus*. Shelburne.

CAPNODIUM ELONGATUM B. & Desm.

Common. Shelburne.

No better proof is needed of the fact that this species grows indifferently on almost any host than the statement that I found it growing in one undistinguishable mass over the following species: *Abies Canadensis*, *Erigeron* sp., *Linnæa borealis*, *Cornus Canadensis*, *Fragaria*, *Gaultheria*, and a *Rubus*.

VENTURIA DICKLEI (B. & Br.) De Not.

On leaves of *Linnæa borealis*. Shelburne.

V. *PULCHELLA* C. & P.

On leaves of *Cassandra calyculata*. Shelburne.

SPHERELLA (LESTADIA) COPTIS (S.).

On leaves of *Coptis trifolia*. Shelburne.

Asci 38–53 μ long by 7.5–8.5 μ broad. Spores 8, hyaline, or with numerous granules, navicular, sometimes curved, 15–20 μ long by 1.5–2.5 μ broad, irregularly placed in the asci. The spores are undivided, but in a few cases there are traces of a cross partition. The fungus forms rather distinctly limited whitish or yellow spots on the leaves in which the perithecia are scattered. The discoloration, however, varies very much in different cases.

GNOMONIA CORYLI (Batsch) Awd.

Common. Shelburne.

METASPHERIA EMPETRI Sacc. *Sphaeria Empetri* Fuckel.

On leaves of *Empetrum nigrum*. King's Ravine.

AMPHISPHERIA APPLANATA (Fr.) Ces. & De Not.

On dead wood. King's Ravine.

DOTHIDEA PIGGOTII B. & Br.

On *Parmelia saxatilis*. Tuckerman's Ravine.

D. DALIBARDÆ Pk.

On *Dalibarda repens*. Shelburne.

D. WITTROCKII Eriks.

On shoots of *Linnæa borealis*. Shelburne.

I believe that this species has not before been found in the United States. It attacks the terminal shoots of the *Linnæa*, causing them to become black and siliculose in shape. In external appearance my specimens resemble No. 40 Fung. Scand.; and although no good spores were seen, there can be scarcely a doubt that they belong to the same species as the Scandinavian specimens.

LEPTOSPHERIA EQUISETI Karst.

On stems of *Equisetum variegatum*. Shelburne.

VALSARIA CINCTA (Curt.) Sacc.

On dead wood. King's Ravine.

ROSELLINIA MAMMIFORMIS (P.) Ces. & De Not.

On dead trunks. Lead Mine. Shelburne.

HYPOCREA RICHARDSONI B. & Mont.

On dead branches. Shelburne.

EPICHLÖE TYPHINA (P.) Tul.

On stems of *Calamagrostis Canadensis*. Gilead.

HYPSILOPHORA FRAGIFORMIS Cke.

On dead wood and *Polypteri*. Shelburne.

This species forms small gelatinous masses of a bright red color on dead wood of several kinds. From a small basal mycelium arises a radiating mass of branching filaments which are changed to moniliiform chains of spherical spores. The fungus has been distributed in Ellis's North American Fungi, no. 521, and described in Michelia,

II. 375, under the name of *Hormomyces aurantiacus* Bon. Our plant, however, does not correspond to Bonorden's figure either in color or the arrangement of the spores. It bears a remote resemblance to Corda's figure of *Torula coccinea*, a species apparently no longer recognized by mycologists. The fungus is probably to be placed in the *Tremellini*, since the substance and the arrangement of the spores suggest a condition of *Dacrymyces deliquescens* described by Tulasne, Ann. Sci. Not., 3 sér. tom. 19, p. 216, 217. This is apparently not *D. cinnabarinus* S., of which I have examined two specimens from Herb. Schweinitz. The two specimens were unlike, and it is doubtful whether either belonged to the *Tremellini*. I am indebted to the distinguished British mycologist, Mr. M. C. Cooke, for valuable notes on this species; and the name above given is, I believe, the one adopted by him in designating it.

TREMELLA AURANTIA S.

Common on spruce trunks.

This species is common on trunks in the mountain region, as in other parts of New England, and attracts the eye by its brilliant yellow color. Specimens are not unfrequently seen four inches in diameter. The microscopic structure of the hymenium shows a greater resemblance to that of *Dacrymyces* than to *Tremella* or *Exidia*. I have compared my specimens with an authentic specimen from the Schweinitz herbarium, and find that in both the basidia are long and slender as in *Dacrymyces deliquescens*, and at the apex grow into two long sterigmata. The spores are somewhat reniform, but acute at the lower end, 20–25 μ long by 5.5–7.5 μ broad, and when mature are 4–8-celled, the latter number being the more frequent. If I am not mistaken, *Dacr. chrysosperma* B. & C. does not differ from *T. aurantia* S. The type in Herb. Curtis has the same hymeneal structure, and the spores are of the same size and shape, and the larger part of them seen by me were 8-celled. There can be no doubt, I think, that the fungus should be placed in *Dacrymyces*, of which our plant is probably the most conspicuous species.

CALOCERA VISCOSA (P.) Fr.

On mossy logs. Shelburne.

HIRNEOLA AURICULA-JUDÆ (L.) Berk.

On trunks of *Abies balsamea*. King's Ravine.

PHYSALACRIA INFLATA (S.) Peck.

On logs in wet places. Shelburne.

A small number of specimens of this curious species were found on a log in a brook which was nearly dry. My specimens were in fruit, and I am able to confirm the account of the fructification given by Peck in Torrey Bulletin, Jan., 1882. The species does not belong to the genus *Mitrella*, where it was placed by Schweinitz, but it is one of the *Hymenomycetes*, closely related to *Pistillaria*, as

correctly shown by Peck. I could find only two spores to a basidium.

CLAVARIA MINIATA Berk.

In woods below King's Ravine.

CL. FUSIFORMIS Sow.

In wet woods. Shelburne.

CL. CRISTATA (Holmsk.) P.

Common in fir woods near King's and Tuckerman's ravines.

CL. AUREA Schaeff.

Shelburne.

EXOBASIDIUM VACCINII Wor.

Common on *V. Vitis-Idæa*, *V. macrocarpon*, and other species.

I am unable to distinguish specifically the forms on *Cassandra* and *Rhodora* very common at Shelburne. The form on *Rhodora* was in good condition as late as the middle of August, and produces prominent circular spots on the leaves of a yellow color often bordered with red.

CORTICIUM AMORPHUM (P.) Fr.

Common on trunks of *Abies*.

C. OAKESII B. & C.

On bark of willow, maple, and other trees.

CRATERELLUS LUTESCENS Fr.

On moss in damp places. Shelburne.

CRAT. CLAVATUS Fr.

With the last, but rare.

HYDNUM CORALLOIDES Scop.

On old logs. Shelburne.

POLYPORUS BOREALIS Fr.

On trunks in woods near King's Ravine.

CANTHARELLUS FLOCCOSUS S.

In damp woods. Shelburne.

PAXILLUS ATRO-TOMENTOSUS Fr.

On trunks. Shelburne.

Besides the above, a considerable number of *Hymenomycetes* were collected; but as they were species more or less common in the Eastern States, I have not thought best to enumerate them.

FUNGI IMPERFECTI.

ASCOCHYTA RUBI Lasch.

Common on *Rubus Canadensis*. Shelburne.

SEPTORIA HERACLEI (Lib.) Desm.

On leaves of *Heracleum lanatum*. Tuckerman's Ravine.

S. HYDROCOTYLIS Desm.

On leaves of *Hydrocotyle Americana*. Shelburne.

S. ACERINA Peck, 25th Rept., 1873.

Common on leaves of *Acer Pennsylvanicum*.

CYLINDROSPORIUM GEI Farlow.

Spots small, distinctly limited. Conidiophores hyaline, amphigenous, very numerous from a dense subparenchymatous mass of hyphæ, which make their way through the stomata, forcing apart the closing cells, slender, about 75–115 μ long, scarcely 3 μ in diameter, simple or branching, ending in very long filiform, hyaline spores 38–110 μ long, straight or irregularly bent.

On leaves of *Geum radiatum* var. *Peckii*. Lake of the Clouds. Mt. Adams.

Common on living leaves of *Geum* on the higher mountains, causing them to blacken and die. Later in the season it is followed by a *Phoma*, which was very abundant in Tuckerman's Ravine in September, although no trace of ascospores were seen. The fungus forms small frost-like spots on the leaves, the conidia appearing on both surfaces.

ILLOSPORIUM ROSEUM Fr.

On *Parmelia obscura*. Shelburne.

ISARIA BRACHIATA Schum.

On a decaying agaric. Shelburne.

GLOMERULARIA CORNI Peck.

On leaves of *Cornus Canadensis*.

This curious fungus is very abundant in the cold dark ravines, and also occurs at Shelburne. It forms white spots on the leaves, and often accompanies *Puccinia porphyrogenita*.

CERCOSPORA CALLÆ Peck & Clinton.

On leaves of *Calla palustris*. Shelburne.

CERCOSPORA PYRI Farlow.

Hypophyllous, forming blackish spots on the leaves. Conidiophores white, short, simple, about 38–57 μ long, 5.5–7.5 μ in diameter. Spores white, linear-lanceolate, usually straight, rarely slightly curved, 4–9-celled, 22–60 μ long by 3–5 μ broad; extremities obtuse, or the base somewhat attenuated.

On leaves of *Pyrus arbutifolia*. Shelburne.

C. EPILOBII Schnd. in Fung. Austr. 532.

On leaves of *Epilobium alpinum*. Tuckerman's Ravine.

RAMULARIA TULASNEI Sacc.

Common on leaves of wild strawberries. Shelburne.

R. HERACLEI (Oud.) Sacc.

On leaves of *Heracleum lanatum*. Tuckerman's Ravine.

R. ARVENSIS Sacc.

On leaves of *Potentilla Norvegica*. Shelburne.

R. NEMOPANTHIS C. & P.

On leaves of *Nemopantes Canadensis*. Shelburne.

R. OXALIDIS Farlow.

Amphigenous, forming small circular blackish spots with a light-colored centre. Conidiophores hyaline, very numerous, densely packed together, 55–75 μ long by 3–4 μ broad, the shorter ones simple, the longer ones vaguely branching. Spores hyaline, linear-oblong, blunt-pointed at both ends, 15–27 μ long by 3–4 μ broad.

On leaves of *Oxalis acetosella*. Mt. Adams and elsewhere.

The present species is probably to be found on *Oxalis* in all the colder parts of New England. I have seen it at Eastport, Me., as well as in the White Mountains, where it is very common. In spite of its abundance, I cannot learn that it has been previously described, nor was the species recognized by several mycologists to whom specimens were sent. As the *Oxalis* also grows in Europe, it would appear strange that a fungus so common here should not be found also in Europe. It is not the conidial form of *Leptostichia Oxalidis* (Rabh.) Sacc., as far as I can make out, nor is there any connection with species of *Entyloma*, judging by the leaves I have examined. In general appearance the fungus may be compared with *Ramularia Philadelphi* Sacc. The spores are one-celled, but occasionally there are signs of a cell division.

Owing to the drought, only two *Characeæ* were collected, — *Nitella flexilis* (L.) Ag., in a ditch at Shelburne, and *N. gracilis* (Sm.), in the Mascot Pond, Gorham, where it was very abundant. The ferns of the White Mountains are so well known that I need only mention a couple of localities for some of the less common species. *Aspidium fragrans* Swz., *Woodsia glabella* R. Br., and *W. hyperborea* R. Br., were collected at the Alpine Cascade, Gorham; and the first-named species was also found at the Crystal Cascade.

In conclusion, I would acknowledge my indebtedness to the following botanists who have furnished valuable information with regard to some of the species enumerated: Dr. Ed. Bornet, M. C. Cooke, J. B. Ellis, Prof. T. M. Fries, C. H. Peck, W. Phillips, C. B. Plowright, and Dr. G. Winter.

Reports of the Councillors for the Autumn of 1883.

Natural History.

By C. E. HAMLIN.

THERE is, for the past season, but little to report which relates directly to Natural History.

Mrs. Lucia D. Pychowska communicates interesting botanical notes, based upon observations made by her from June to September last, upon Mt. Adams and about the head of King's Ravine. The notes are herewith transmitted for publication.

Mr. George H. Witherle, of Castine, a member of the Club, writes that on his annual autumnal excursion into the wilderness of Northern Maine, this year made to the Sourdnhunk Mountains and Lake Chesuncook, he found *Pinus Banksiana* growing near Lake Ambejijis. The southern limit, in Maine, of that interesting boreal species has heretofore been regarded as occurring at Lake Matagamon and the other head-waters of the river of the same name, — the so-called "East Branch" of the Penobscot.

A valuable paper upon the Cryptogams of the White Mountains, from the pen of Professor W. G. Farlow, is announced for publication in APPALACHIA.

As indirectly pertinent to the purpose of this report, it may be stated that Mt. Ktaadn will henceforth be reached by naturalists and tourists with far less difficulty and expense than have been unavoidable in past years. A road passable for buckboards was opened, in June last, from Patten to Sandy Stream, leaving only six miles thence into the Great Basin to be traversed on foot. The road crosses the Matagamon at Patterson's, and from that point follows the old logging road six miles, and a new one five, to Ktaadn Lake, where a log house has been built, at which Mr. J. W. Collis, of Patten, during the season furnished excellent board and accommodations to visitors at reasonable rates. He kept in readiness teams, guides, tents, and all needed supplies; and he proposes next year to put up other lodges, so that parties may have separate quar-

ters, if desired. The ride from Ktaadn Lake to the crossing of Sandy Stream is about five miles. Leaving Bangor by the morning train to Mattawamkeag, the tourist can reach Patterson's at evening of the same day.

It may not be out of place to add that Mr. J. G. Elder, of Lewiston, has prepared for publication in the collections of the Maine Historical Society a recently discovered paper describing an ascent of Mt. Ktaadn made in 1820, of which he sends the following account:—

"I obtained it some four years ago from a dealer in Boston; and it was, I suppose, among the papers of the late General H. A. S. Dearborn, whose superscription it bears. [He may have received it from his father, General Henry Dearborn, who, from 1784 to the close of his eight years of service as Secretary of War under Jefferson, in 1809, was a citizen of Maine, in whose affairs he retained deep interest till his death in 1829.] Unfortunately the name of the author is not given. It occupies ten pages of letter-size paper, and is very neatly written.

"The party ascended the Penobscot River; and the first place of which any description is given is 'Oldtown.' The author refers to the 'Indian Settlement' at the mouth of the Mattawamkeag River, — of his meeting the chief of the tribe, 'Jean Etienne,' at that place, of the tradition of the 'bloody battle' between the Penobscots and the 'Mohawks,' of the habits of the Indians at that time, — and gives a general description of the country, lakes, mountains, etc.

"The first complete view they had of 'Katahdin' was when they entered 'Lake Umbagogosi' [Ambejijis], which, judging from the narrative, made a profound impression on the mind of the author. 'On the 4th of August' [1820], says the writer, 'we arrived at the small stream, Abalajakomejus, at the foot of Katahdin.' On the 9th they commenced the ascent of the mountain, and stopped that night on the 'right of the gully,' where they discovered the 'hut occupied' by Major Campbell and his party the year before; and on the 10th completed the ascent, took the height of the mountain, being obliged to borrow the barometer of the British surveyor for that purpose. The height is given as 5,385 feet."

This paper gives the first clew to the origin of the foregoing

figures for the altitude of Ktaadn, which have often appeared in print and upon maps. From a single barometric observation made, Sept. 23, 1837, during a storm of snow and hail, Dr. Jackson computed the elevation to be 5,300 feet.

BOTANICAL NOTES MADE IN THE SUMMER OF 1883 AT RANDOLPH, N. H. — BY LUCIA D. PYCHOWSKA.

THERE is little to add to my botanical notes of last year, except to give the times of flowering this season of some plants found on the higher ridges and summits of the White Mountains, and to mention the finding of the fern *Aspidium fragrans* on the cliffs of the "Ice Gulch," between Randolph and Crescent Mountains, N. H.¹

June 30. — Mrs. and Miss Pychowska found in blossom on Durand Ridge (top of eastern wall of King's Ravine), just below tree line, *Cornus Canadensis*, *Linnaea borealis*, *Trientalis Americana*, *Coptis trifolia*, *Clintonia*, *Habenaria obtusata*, and *Listera cordata*. Between the first bare spot on the ridge and the Gateway of King's Ravine were in bloom *Ledum latifolium*, *Vaccinium Vitis-Idæa*, *V. uliginosum*, and *Salix Cutleri*. *Rhododendron Lapponicum* and *Diapensia Lapponica* had been abundant, but were nearly out of flower. *Empetrum nigrum* was entirely out of bloom. A few tufts of *Arenaria Grænlandica* were just coming into blossom. The ground surrounding the Gateway was quite yellow with *Geum radiatum* var. *Peckii*. At Madison Spring, head of Snyder Brook, was found *Pyrola minor*, nearly out.

July 3. — The same ladies went up to the top of the southern wall of King's Ravine. Beside the snow-bank still remaining at the head of the stream, Miss Pychowska found *Cassiope hypnoides* in flower. On the rocks, a little higher up, were abundance of *Ledum latifolium*, *Vaccinium Vitis-Idæa*, *Arenaria Groenlandica* in full bloom, *Potentilla tridentata* not yet quite out, *Salix Cutleri*, and *Diapensia* entirely out of flower. Still higher up, by the side of Lowe's Path to Mt. Adams, we came upon beds of *Loiseleuria procumbens*, *Phyllodoce taxifolia*, and a few scattered plants of *Kalmia glauca*, all in full blow. These three latter plants were not found upon Durand Ridge, and, on the other hand, very little *Rhododendron* was found growing upon this northeastern slope of Mt. Adams. *Diapensia Lapponica* was found in both sections, especially abundant on Durand Ridge.

July 10. — Ascending Mt. Adams, the above ladies found the azalea (*L. procumbens*) and the purple heath (*P. taxifolia*) entirely out of bloom; *Arenaria Grænlandica* abundant.

July 25. — Found at Star Lake, between Madison and Adams, *Vaccinium oxycoccus*, nearly out of flower.

¹ This locality has already been indicated in Eaton.

September 18. — Found on Durand Ridge large patches of *Rhododendron Lapponicum* in bloom for the *second time* during the season.

And here may I be permitted to say a word as to the care that ought to be used that the rarer plants may not be exterminated by the reckless treading of pedestrians over the mountain ways, or by the still more reckless behavior of botanists in search of "specimens." It may be that these lovely children of the rarer atmosphere and biting cold of the loftier regions may become so scarce that the above record will seem a mere tale of bygone times to the future explorer, — a consummation devoutly to be deplored!

Reports of the Councillors for the Autumn of 1883.

Exploration.

BY EUGENE B. COOK.

THE Councillor of Exploration has the pleasure of stating, in his autumn report, that many of the neglected regions, concerning which it was desirable to obtain information, have been visited during the past summer, and papers have been prepared by a varied corps of writers. Mr. W. L. Hooper has written an interesting account of his trip over Mt. Osceola, the Twin Mountain Range, etc. Messrs. Edmands and Fay have made explorations in the region about Lake Willoughby, in connection with some topographical work done by Mr. Edmands in Northern Vermont. Miss S. M. Barstow has visited the "Imp Face," and graphically portrayed its characteristic features. Mrs. L. D. Pychowska has written an appreciative paper upon the attractions of Randolph. The Deception-Mitten Range, the Carter Range, Imp Mountain, Round Mountain (near the Castellated Ridge), and Mts. Bowman, Wildcat, Pliny, Royce, Hale, Parker, and Nancy, have all been traversed, and now no longer belong in the list of mountains that have been slighted. A paper upon Shelburne Moriah has been written by your Councillor, as promised. Observations taken in 1877 and 1883, with four different aneroid barometers, tell that the height of Gorham Moriah is not far from five hundred feet lower than its ascribed eleva-

tion. An explanation is offered in the supposition that one of the peaks of the Carter Range was formerly known as Mt. Moriah. In confirmation of this hypothesis, a stereoscopic view taken by Kilburn Brothers, of Littleton, presents the prominent peak of Mt. Carter seen from Gorham as "Mt. Moriah."

One of the unexplored spots mentioned by a predecessor was the Ravine of the Castles. Last year this was visited by the writer. A little way from Spaulding's Spring starts a stairway made by a slide of broken rocks, leading down into the Ravine, and by it the travelling is easy, and excellent views are obtained of the Castellated Ridge. The growth of small trees below is not obtrusive, and the way is not difficult. At first, water is heard gurgling far below the rocky slide, and within the tree growth it gushes forth from an almost circular orifice of rock adorned with moss. Down the stream, trees greatly obstruct the view of the Castles, but there are several fair outlooks. No cascades of note are on the stream until just above where the Ravine of the Castles joins the Ravine of the Cascades. These cascades are well worth seeing, and are passed by the new path which leads to the Castellated Ridge from the Bowman Place.

Mt. Wassataquoik, in Maine, is considered by Professor Hamlin to be of rather a mythical character,—no one he met in the Ktaadn region knowing anything about it. A Mt. Wassataquoik is set forth on Chace's state map of Maine, and it is probable had some geographic authority for its existence. The height, moreover, is given as 5,245 feet, which, curiously, is precisely the now accepted altitude of Ktaadn itself. It was the opinion of a gentleman who was Professor Hamlin's companion during a seven days' encampment in the Great Basin of Ktaadn, that Wassataquoik "signified the part of Ktaadn north from the basins, to which a separate designation might naturally be given, taken from the Wassataquoik stream, which winds around the northern end of the range."

Of the list of peaks named by my predecessor as desirable to explore, but four now remain unchronicled, namely, Mt. Huntington, and Mts. Cushman, Waternomee, and the Blue

Ridge (bordering Moosilauke). These, next year, will probably have their historians. Many of the old fields of exploration require additional and more careful survey, and there are many lesser fields yet unharvested.

MT. HALE. BY E. B. COOK.

HAVING enjoyed a delightful walk on the 21st of July over Cherry Mountain, and its lower head, which commemorates the bird of Athene, in company with a large and enthusiastic party of fellow-Appalachians, the writer, on the 23d, resisted the allurements of the grand excursion over the Twin Mountain Range, and devoted himself to a solitary pilgrimage to the arcana of Mt. Hale. The narrator left the Twin Mountain House at half-past eight in the morning, starting by the road which leads to the railway station, and, a very short distance therefrom, passed through a gateway which guards a road that goes by a barn, and then traverses some fields which lie in the direction of the desired summit. After fourteen minutes' walk, the road was found to lead into woods in which the axe had accomplished much havoc. There is an awe connected with the idea of primeval woods, but there is something much more awful about prime-evil logging-roads! Fortunately, the road followed was but little obstructed by debris; but there were occasional moist spots where it seemed as if perpetual spring might reign. As none of the ramifications of the wood-road appeared to lead where the writer wished to go, he had recourse to his compass, and went southward through the woods, which only occasionally interposed objections. At a quarter after ten an extensive logging *demolition* was encountered, but it was successfully flanked, and a well-cleared wood-road led upward. The direction taken by this road was not precisely the one desired, but it was decided to be available. At a little before half past ten, the end of the road was reached. Proceeding upward, the narrator crossed a line of blazes running east and west; and the elevation as interpreted by an aneroid was found to be 1,511 feet above the Twin Mountain House. After twenty-five minutes more of walking, a lower prominence of Mt. Hale was surmounted, the height of which was found to be 3,157 feet above the sea-level. At three minutes of twelve a higher crest was reached, of which the altitude was 3,252 feet. The tree-growth was both thick and high, so that the outlook was very limited, being chiefly toward the north and northeast. To the southward, a long way off,—so long a way that it seemed as if the New Zealand Notch had somehow got between,—loomed up another, much more exalted head of Mt. Hale. A considerable descent was required, and, in pursuing a direct route, the writer came upon the plentiful, cool waters of a tributary of the Little

River, flowing from between the two chief divisions of which Mt. Hale is composed. It seemed an enticing place for refreshment, where one's too feverish ardor could be checked upon the bank of the stream, and draughts of the purest issue could be collected without limitation. After an invigorating lunch, which was not allowed to overreach the appropriate time, feeling "hale and hearty," the narrator resumed the line of march, and at ten minutes after two an eminence of Mt. Hale was reached that stood 4,106 feet above the ocean. This was not yet the summit; for a higher elevation was visible, which beckoned one still farther onward. At a minute after three the summit was scaled, and one could look down complacently on all that was near. The top of Mt. Hale is wooded; but on both its highest heads there are bald spots amid the tree growth, where the gales of winter seem to have disposed of trees of too lofty aspirations. As the Twin Mountain House does not appear to be visible from either of the highest heads of Hale, they cannot be seen from it. The large steam-mill upon the Lower Ammonoosuc, and its surrounding houses, — perhaps a little over a mile and a half to the eastward of the Twin Mountain House, — are plainly to be seen. On the crowning crest of the mountain, by a change of position, excellent outlooks can be obtained in every direction. The valley of the Lower Ammonoosuc is overlooked, and Cherry Mountain and the Mt. Washington Range stand out nobly. The mountains bordering on the Saco seem near, and appear to great advantage. The chief features of the view, however, are the Giant Twins and the other magnates of the Range, and, finest of all, the remarkable notches between Carrigain and Lowell, and Lowell and Anderson, and Mts. Carrigain, Lowell, Anderson, and Nancy, themselves. By mounting a sturdy balsam-fir of no very great height, near the very summit of Mt. Hale, an unbroken circular view can be obtained. The "Little River Mountains" do not seem to possess sufficient individuality to be so called, but appear, from the top of Hale, rather as a gently scalloped ridge connecting Mt. Hale with Mt. Thompson and the Twin Range. After a careful digest of his barometric observations, the writer found the summit of Mt. Hale to be 4,198 feet above the level of the ocean. It was not until a quarter of four p.m. that the return homeward was begun. A northeasterly course was at first pursued, until some of the tributaries of the New Zealand River were met; and in following several of these for short distances, a number of handsome cascades were found. At six minutes past five, one of the upper branches of a logging-road was entered, that led into the main road which follows down the valley of the New Zealand River. The main road was evidently considerably used, and led out to the large steam-mill upon the Lower Ammonoosuc River, which had been seen from the top of Mt. Hale. The highroad from the mill was soon traversed, and at a quarter after seven the narrator reached the Twin Mountain House.

SHELburne MORIAH. BY E. B. COOK.

IN the year 1878, when staying at Mr. Harvey Philbrook's, on the north side of the Androscoggin, about a mile from the railway station, Shelburne Moriah seemed a very inviting object for exploration. Three prominent ridges are to be seen from there, which lead down from the crest of the mountain toward the valley on the north. The most easterly of these ridges is on the east side of the upper waters of Clement's Brook, and has been mistakenly designated as "Mount Winthrop," on Walling's map; the middle ridge is on the western side of the upper part of Clement's Brook; and the third ridge is to the west of the last-mentioned one, and is remarkable for the rocky crest which distinguishes it. To the west of the third ridge is a rather expansive col, connecting Shelburne Moriah with the true Mt. Winthrop, which rises considerably above the col. Mt. Winthrop is situated west of the Mt. Winthrop House, at Shelburne, and lies between the exit of Clement's Brook into the Androscoggin, and Rattle River. A barometric measurement made by the writer in 1877 gave Mt. Winthrop an elevation of 1,557 feet above the sea. On the northern side of Mt. Winthrop a very conspicuous bare wall of rock, fringed by luxuriant moss, abuts upon the road to Gorham. This rock is called Moses' Rock, and is about three quarters of a mile from the railway station at Shelburne.

From Philbrook's is also to be seen a tongue-shaped clearing leading into the woods toward the middle ridge of Moriah. On his first ascent the writer followed this clearing, then traversed the woods by compass aiming at the ridge, crossed Clement's Brook, and followed the middle ridge up to the summit of the mountain. Another way of ascent is by following a wood-road which leads over some cleared fields south of the Mt. Winthrop House, and goes up the valley of Clement's Brook. The turns of Clement's Brook are but imperfectly represented on the map, and there are branches that are not given. Upon the northeastern side of the wood-road, a little over a mile beyond the Mt. Winthrop House, rise abrupt, rocky cliffs, which command a fine view of Shelburne Moriah, and are on an outlying eminence, known as "Mt. Olivet" by the circle at Philbrook's. The wood-road is followed some distance beyond the cliffs, to where the most suitable point on the middle ridge is reached. Thence the way up the mountain is the same as by the first route. There is still another way of ascent, by a wood-road which follows the Rattle River. This road was a reasonably good one in 1877, and led high up upon the side of Shelburne Moriah. After the wood-road ends, the mountain side offers but few obstructions. The wood-road which follows up the Rattle River branches off from the Shelburne-Gorham road a short distance to the west of where the road from the Lead Mine Bridge comes in. A little way up the wood-road an old mill and its wooden aqueduct are to be seen.

The name "Bald Mountain" never could have been given from the

Shelburne side, for the summit of Shelburne Moriah appears clad with trees, with a moss-covered ledge a little way down looking a little east of north. Where the middle ridge joins the top, some sturdy evergreens have to be pushed through in order to reach the moss-covered outlook just mentioned. From this spot the view embraces the Androscoggin valley below, Mounts Hayes, Baldcap, Ingalls, Carlo, Goose-eye, "Old Speck," Bear River, Whitecap, etc. In passing from the mossy outlook to the southern side of the mountain, a belt of scrub has to be traversed for about sixty yards. Ten years ago, Mr. William R. Thayer, of Waverly, Mass., and the writer, cut a path through the scrub. Although the very highest part of Shelburne Moriah is surmounted by an obstructing growth of trees, yet on the eastern, southern, and western sides, a very little lower than the crest, the top is composed of rock either entirely bare or covered by moss or some low growth. From this encircling belt the outlook is wholly unobstructed. Here one can closely survey the wilderness of the Wild River valley, with the peaks of Caribou, Speckled Mountain, Royce, and Baldface, and can inspect, at great advantage, the adjoining summits of the Moriah Range and the back of the Carter Range. Many lakes are to be seen; and the Great Range appears grandly, overtopping the Carter giants.

An aneroid measurement of the height of Gorham Moriah, made by the writer in 1877, indicated that it was several hundred feet lower than the height accorded to it. At the same time it was found that Shelburne Moriah was 329 feet lower, and Middle Moriah three feet lower still. The wide difference between the accepted height of Mt. Moriah and the elevation indicated by the writer's aneroid led him to feel confident that some great misapprehension must exist. On looking at the heights of various mountains given in Mr. J. H. Spaulding's "Historical Relics of the White Mountains," my sister, Miss Cook, was struck with the fact that the height of Mt. Moriah was given, but no mention was made of any of the peaks of the Carter Range. The distance of Mt. Moriah from Mt. Washington was set down as seven miles, and the height as 4,700 feet. My sister surmised that a peak of Mt. Carter was intended. After this suggestion had been broached, Mr. W. H. Peek, of Chicago, on searching among some stereoscopic views he had with him, found one taken by Kilburn Brothers, of Littleton, under which was printed "Mt. Moriah." The picture really presented the peak of Mt. Carter, which appears so prominent as seen from Gorham. This, then, offers a solution to the discrepancy of heights.

The writer was up Mt. Moriah twice this season, — the second time in company with Mr. Peek, when a battery of three aneroid barometers was brought to bear upon the position. The altitude cannot be far from 4,165 feet. In consequence, Shelburne Moriah must have a height of 3,836 feet, and Middle Moriah of 3,833 feet. On the 14th of September, 1876, my cousin, Mr. Robert J. Walker, and myself, made an excursion over the peaks of the Moriah Range. We left Gates's Cottage,

at Shelburne, at seven o'clock in the morning, and were driven to Mr. Hitchcock's farm. From there we ascended the mountain-path, — the lower part of which, at that time, was much overgrown and obscure. We were a little over two hours and a half reaching the top of Gorham Moriah. From this summit to the top of Middle Moriah took us just fifty-two minutes. The descent from the top of Gorham Moriah was found to be steep, and obstructed by scrubby growth. Farther along the way, the going was easy, being much along stretches of rock. At a spring between Middle Moriah and Shelburne Moriah, we stopped twenty-five minutes to take our lunch. One's attention is arrested by the arrangement of the rock on the way up Shelburne Moriah. There is a remarkable rectangular basin, having a considerable inclination in accordance with the slant of the strata of rock, which contains a body of water that appears of a dark greenish hue. A well-squared parallelopipedon of rock seems to have been somehow removed. As well as the writer can remember, the width of the basin was over four feet, and its length over five yards. The travelling time between Middle and Shelburne Moriahs was fifty-eight minutes. It was twenty-seven minutes after one when we stood upon the top of Shelburne Moriah. Our return was made by the Rattle River wood-road. An hour and forty-eight minutes was taken in going to the Lead Mine Bridge, and from there we reached the Gates Cottage in thirty-three minutes. The pace, however, was a rather rapid one. The following year, Mr. R. Stuart Chase, and two of his sons, of Haverhill, Mass.; my cousin, Miss C. L. Walker, of Washington City; my sister, Miss E. W. Cook, and myself, camped out one night on the top of Gorham Moriah, and the following day traversed Middle and Shelburne Moriahs, and returned by way of Rattle River. One of the incidents of this excursion was the astonishment of the party, on the evening of the camping out, at the rising of a sickle-shaped moon, when a full moon was looked for. Soon we remembered that the moon was to rise eclipsed!

MT. PLINY. BY E. B. COOK.

WHEN one considers the wide range taken by the elder Pliny, as soldier, sailor, advocate, grammarian, historian, and especially as traveller and naturalist, the naming of the extended Pliny Range seems an appropriate tribute of remembrance. It is therefore to be regretted that the highest peak of the range is not called Mt. Pliny, and that the name is subordinated to a lesser eminence. The genial Starr King, had he been consulted, would doubtless have protested against any usurpation of an eminence due to another, — the great ravine named after him being large enough to hold a reasonable ambition. It was, in a measure, owing to such reflections, that the writer felt incited to pay a visit of respect to the "classic shade" of Pliny. A little before eight in the morning, he

started from the Ravine House in a conveyance for Stag Hollow Bridge, where a barometric observation was taken at 9 A.M. There is a wood-road which leads up Stag Hollow, which has a branch — with many branchlets — that finds its way into the hollow between Starr King Mountain and Mt. Pliny. By taking this road, there seemed to be considerable danger that the thickness of the woods might prevent one from knowing his precise position, so it was decided to be surer to proceed directly for the mountain by guidance of the compass. A small outlying eminence of the range intervened, which must be rounded or crossed. It was very distinguishable by reason of the vivid autumnal tints of its trees. Aiming, then, at the eastern end of this gayly clad eminence, partially open fields and more or less open woods were traversed. There seemed to be an intemperate profusion of *aqua pura*, and the travelling was often buoyant — as springs would make it. The shoulder of the brightly colored eminence was struck high up, and from it was visible the exalted, sombre head of Mt. Pliny. The course was then down into an intervening hollow. A little stream was crossed, and a wood-road was found and followed. Before long the wood-road ended, finishing its course in the possession of the brush! From this point the forest was unadorned by carvings of the axe, and the pedestrian sped rapidly upward. Wherever an apparent profusion of light seemed to indicate an outlook, the explorer went in search of a view. A few glimpses outward were obtained, but the enclosing trees were very numerous. The summit was reached at a quarter before twelve. The crest is not large, and a curious small cut, running northwest and southeast, divides it into two parts. Rain falling into this channel might flow off in opposite directions. There are a number of denuded spots, caused, probably, by the winter winds. On the summit and around the crest several outlooks are to be found, but the tree growth holds almost entire possession. Reflecting upon a remedy, the narrator bethought him of the efficacy of balsams; and by climbing four firs, on different sides of the crest, uninterrupted views were obtained toward every quarter. Near by, stand Starr King and Round Mountains, and the various extended shoulders of the range. Cherry Pond glistens brightly below. The well-known forms of Mansfield and Camel's Hump in Vermont are plainly to be seen. Mt. Lafayette stands out clearly in the distance. As ever, the Mt. Washington Range preserves its supremacy; and the Carter Range is visible, extending beyond. Old friends in Maine, especially about the Grafton Notch, do not escape one's admiring attention. The unique part of the view is of the Ravine of the Castles and the Ravine of the Cascades, and the dividing, angular "Emerald Tongue." The turns of the ravines and the bends of the streams are most clearly presented to sight. The summit of Mt. Pliny was found to have an elevation of 3,572 feet above the sea, — being 371 feet lower than Starr King Mountain. An hour was spent on the summit, and then the writer descended the mountain on its eastern side. In

half an hour a brook was struck, and there a halt of twenty minutes was taken for lunch. Soon after lunch, the heads of various logging-roads were crossed, which lead into the main wood-road of Stag Hollow. Being in the humor for further exploration, the writer directed his course toward the Pond of Safety, and struck the Upper Ammonoosuc not far from where it issues from the pond. A long stretch of monotonous forest was then traversed. On the way, some glimpses of Randolph and Crescent Mountains were obtained; and at length the depression between them, back of the Ice Gulch, was reached. Here it became necessary to hurry, as the sun was fast nearing the horizon. The course was in part by compass and in part by wood-road, until the mill on the west side of Moose Brook was reached, a short distance from Dixon's. From here, owing to the waning light, — the date being the 18th of September, — it became necessary to go down the branch road which connects with the Gorham highroad, and by the latter return to the Ravine House. A full moon served to light the way and to beautify the scene, and the Ravine House was safely and gladly entered at half-past eight o'clock.

MT. CARIBOU. BY E. B. COOK.

THE rocky crest of Mt. Caribou, seen from Shelburne Moriah, gave promise of an excellent outlook. As the wide-stretching forests of the Wild River valley did not seem a promising way of approach, a reconnaissance was made by the writer down the Androscoggin valley. The best line of attack from Shelburne was found to be *via* Gilead. About two miles therefrom, on the way to West Bethel, a road starts off to the right, passing through a gate, just beyond which stands a school-house. A tolerable road leads thence to the farms scattered along Bog Meadow. The road passes over Bog Meadow, a portion of which consists of a chain of narrow, connected fields devoted to the production of hay. Farther along, some rather desolate farms are passed, after which the road goes into the woods and follows a stream, on its western side. A bridge is seen before long, near which are two or more houses, — one being a rather elegant cottage, unoccupied whenever the narrator has chanced to pass it. Two routes are here at one's choice. One can either continue by the wood-road which keeps along the western side of the stream, follow the road to its end, and then ascend a ridge which leads up to a point not far from the top of Mt. Caribou; or one can cross the bridge and follow a logging-road that keeps on the eastern and southern side of the stream, and ends only a short distance below the summit. This latter route is preferable, because the natural line of ascent brings one out directly on the summit. By the other approach, when the top of the ridge is reached, it is necessary to cross a hollow which separates "Wrong Mountain" from the highest head of Caribou. From West Bethel there seems to be

an easy approach, by means of a high-road and a wood-road branching therefrom, which leads below the east side of the mountain. In Professor Hitchcock's "Geology of New Hampshire" is an interesting plate, giving outlines of some of the mountains seen from Mt. Caribou. The Moriah and Carter ranges, from Caribou, appear finely over the valley of the Wild River. Speckled Mountain, Mt. Royce, and Baldface Mountain, invite one to continue one's walk along the whole line. Many lakes in Maine offer their bright mirrors to beautify the landscape. The top of Mt. Caribou is in possession of rocks and moss, is rather long and narrow, and its surface is undulating. From Shelburne Moriah this waving line is well seen; but from Mt. Royce the top of Caribou seems a fantastic pile of rock, suggestive of Mts. Crawford and Chocorua. In the season, excellent blueberries are to be found on Caribou, and its crest is adorned with the Alpine silver-chickweed. The writer has ascended Caribou four times. In 1877, on a very warm day, my niece, Miss Pychowska, and I, made the ascent. We left Gilead Station at half-past nine, A.M., reached the bridge that has been mentioned at eleven o'clock, and stood on the summit of Mt. Caribou at seven minutes before one. In coming down, the bridge was reached in an hour and twelve minutes, the school-house in forty-eight minutes more, and the railway station at Gilead in thirty-seven minutes,—the whole time from the summit being two hours and thirty-seven minutes. The time taken in making the ascent was three hours and twenty-three minutes from Gilead Station.

EVANS NOTCH, ROYCE, AND BALDFACE. BY MISS M. M. PYCHOWSKA.

Osgood's White Mountain Guide (1882) gives the following account of Mt. Royce and the Evans Notch: "Mt. Royce is a double-peaked summit, with the Maine and New Hampshire frontier running between its crests. It is near Baldface, on the N. E., and is rarely ascended, the slopes being terribly rugged. The summits are great rounded masses of dark rock, and are weirdly picturesque towards evening, when the shadowy ravines make strong contrasts. The W. peak is said to be 2,600 feet high, but is probably higher. 'Blanchard's Basin' is a sequestered pond on this mountain, famous for its many trout. The distance from the road to the top of Royce is 2½-3 M. Evans Notch leads by the base of this mountain into Shelburne, and has been traversed by wagons and sleighs. There is no road, however. The scenery in this pass is very striking. Speckled Mt. is a vast mass E. of Royce, partly covered with ledges, and but rarely visited."

The map leaves a still wider field for speculation as to the contents of Batchelder's Grant. In 1875, 1876, and 1877, Mr. Cook, our present Councillor of Exploration, had several opportunities of studying this region,

especially from the neighboring summit of Mt. Caribou. Out of this stimulating combination of knowledge and ignorance arose the long-cherished desire to take possession of the unknown land by actual measurement of sole leather. An accidental meeting with Mr. Benjamin F. Osgood, of mountain fame, increased our stock of information. He declared himself a Chatham man, and said he had been through the Notch last fall. From him we learned that the distance from Gilead to Stowe is nine miles, and also that we could find accommodation at several houses in Stowe and North Chatham.

On Tuesday, July 31st, five of the sojourners at the Ravine House, Randolph, headed by Mr. Cook, boarded the train at Gorham, N. H., to leave it again at Gilead, Me. At 9.50 A.M. the two gentlemen of the exploring party observed their aneroids at Gilead station. Then, shouldering our packs, we walked up the highroad a half-mile to the Wild River bridge.

Here, on the east bank of the stream, we found a well-travelled road leading up the Wild River valley, as we desired. A gentle shower sprinkled us as we entered between the wooded hills; but the rain was not heavy enough to shut out an occasional view backward to the mountains beyond the Androscoggin. Forward we caught one little glimpse of the two heads of Royce. Our next adventure was meeting a load of hay, the obliging driver of which gave us directions (with his ox-goad drawing a map in the sand), whose full excellence we could appreciate only after we had been over the ground. At all events, we understood that if we always kept the right-hand road we should not miss the Notch.

At a distance of about three and a half miles from the highroad in Gilead, the valley opened out before us, giving us an opportunity of realizing our situation. Directly in front was the end of the northern extension of the Mt. Royce range, dividing the valley of Evans Brook from that of the Wild River. Away over the wilderness of the latter valley rose Carter Dome, the north peak taking a peculiarly fine form; and, nearer, other portions of the Carter-Moriah chain were visible. Up the Evans valley the opening between the mountain spurs gave promise of the desired notch beyond, and in that direction the road now turned. Between the streams, extending towards their junction, lies a tract of apparently long-cleared and fertile *intervale* land, and in the midst of this we saw the "new buildin's" promised us by the driver of the ox-team. Presently a branch from our road crossed the brook, by a ford, to the settlement; but a few steps farther we came upon a foot-bridge by which we reached the new house and barn, dry-shod, at 11.20. Here we gathered that we were in Major Hastings's Location, and that one object of the new house is the accommodation of lumbermen and fishermen; also, that other occasional guests would not be refused. Following the directions of our new informant, we recrossed the foot-bridge and pursued our way up the east side of Evans Brook, "three miles to the camp." Our road was a direct, open, and level avenue through a fine forest of hemlock, beech, and birch, with

ever-increasing tokens of recent and extensive bark-stripping. On our way we crossed two considerable streams flowing into Evans Brook.

At 12.45 we reached the camp, and found the bark-strippers in possession. Some of the more humble-minded of the exploring party, dreading the loss of time in the maze of new cuttings, again sought instruction in regard to the Notch trail. A pleasant-spoken young Canadian obligingly led us back a short distance, and set us upon the well-worn footpath, of which the unassuming beauty and directness of purpose declared the antiquity among the recent slashings. Deeply cut into a tree we found the date, 1860. A person traversing this route from south to north need have no difficulty in keeping the direct way, which does not pass the camp. To such as may follow in our footsteps southward, the best advice I can give is to keep to the best-travelled road, which leads to the camp, and thence strike westward, thus soon intersecting the unmistakable Notch trail. It seems hopeless to attempt describing the position of the little spruce-tree with five blazes which marks the divergence of the path from the road.

The ground now rises more, though always gently, and the mountains approach more nearly on either hand; while our narrow, forest-shaded track is bordered by banks of trailing arbutus, dalibarda, and other delicate growths. We are now fairly in the defile, the bold cliff structure of Mt. Royce revealing itself more and more as we advance, until the beauty and grandeur have surpassed all our expectations. The greedy eyes of the explorer are apt to magnify a new "find" in the first seeing; but when we made our return journey, two days later, our first impression seemed fully justified. No one, I think, if he were beforehand duly impressed with the fact that after all Royce is only a little mountain, could be dissatisfied with its brave granite front fringed by lovely tree-growth. The trail keeps always on the eastern or Speckled Mountain slope, from forty to several hundred feet above the stream. The watershed in the Notch, situated about a mile beyond the camp, is, by aneroid measurement, 1,526 feet above the sea, 826 feet above Gilead, and about 950 feet above North Chatham. A carriage road, or even a railway, may some day take the place of the modest footpath; but at present I should be able to find no work for the Department of Improvements beyond the placing of a guide-board or so, and the thinning out of trees at several fine view-points. It is now chiefly in winter by sledges that the pass is used as a means of communication between the Gilead and North Chatham valleys. In the summer season the distance, by highroad, between the two towns is over fifty miles. We have also heard that there exists a branch trail communicating directly with Shelburne. This probably diverges from the Wild River road somewhere near Hastings's Location.

Afternoon shadows were deepening as we reached the southern end of the Notch. Our road, of which the compass course through the defile had been about W.S.W., now turned more directly south around the slope of Speckled Mountain. The enclosing mountains stood apart, and what had been defile became valley. The views at this turn were particularly fine.

Both heads of Royce, and all its grand fortifications rose to our right on the other side of the deep-lying valley; and away southward spread the North Chatham intervale, with Baldface beyond. An opportune shower heightened the beauty of this scene, while it prepared the explorers better to appreciate the comforts of the lowland homestead for which they were bound. Another mile, making somewhat over three miles from the bark-strippers' camp and over nine from the Gilead highroad, and the pastures and the first house were reached. Mr. Johnson, this nearest neighbor of the Evans Notch, is willing to accommodate travellers. From his house, which is, I think, in the town of Stowe, Me., two roads start, by either of which North Chatham is distant three miles. Thus the whole distance from Gilead Station to Mrs. Asa Chandler's is between twelve and thirteen miles. We had no mind to quarrel with the length of the way; for had we not come into a new court in the Appalachian palace of the White Hills, — in which we saw no familiar face save that of Pleasant Mountain, its isolated house-crowned form guarding the open seaward-looking door of the valley? Behind us was the postern-gate of the Evans Notch through which we had entered, the wide-spreading mass of Speckled Mountain and its dependencies enclosing us on the north and east, while from north to southwest stretched the fortress wall of Royce and Baldface. A little after five o'clock the somewhat wet and dragged tramps arrived at the pretty willow-guarded house of Mrs. Asa Chandler, where hosts and guests vied with each other in making them comfortable and happy.

According to our Walling map, the Great Cold River takes rise in "The Basin," a wooded amphitheatre lying between the west head of Royce and Mt. Meader. The true main source is in the Evans Notch, where the streams from Royce and Speckled Mountain combine to form "The Diamond." Mr. Charles Chandler told us of this hidden gem, and so on our home journey we sought it out. More than two miles from Johnson's the Notch trail crosses, at right angles, a brook which has worn quite a channel into the slope of Speckled Mountain. The trail is here scarcely fifty feet above the bottom of the defile. A little below the path the stream divides, sending part of its waters to the Saco by the Great Cold River, and part to the Wild River and the Androscoggin by Evans Brook. Directly opposite this divide, and perhaps not more than a hundred yards distant, the brook that dances down the steep ravine between the cliffs of Royce forks in a similar way, thus forming the other faces of this diamond island. In the present condition of these divides, the greater part of the water from Speckled Mountain flows southward, while that from Royce flows toward the north.

On Wednesday, August 1st, Mr. Cook and the writer left Chandler's at 8.35 A.M., bound for Mt. Royce. It is not necessary to enter into particulars in regard to the route taken by the adventurers, for theirs was not an example to be imitated. Suffice it to say that when we had nearly reached the end of the road on the west bank of Cold River, we followed

up the main stream into the Notch. At 10.40 we left the brook, climbed a steep wooded slope, and soon found ourselves under the solid, beetling brows of our mountain. We were obliged to work our way up experimentally, ledge by ledge, several times having to retreat before a flat refusal of the stern face to allow our further progress. This added greatly to the expense of time and labor; but, as usual, the reward did not fail. Beside the near study of the noble weather-stained and tree-fringed cliffs of Royce, the views down into the Notch, and through its frame to the picturesque bare summit of Mt. Caribou beyond, were very impressive. All difficulties were surmounted, and the eastern head reached, at 12.50. In bygone years fire has cleared both crowns of Royce from all growth that would obstruct the view; but fortunately the destroying element could not prevail against the many springs which make the crevices between the ledges luxuriant with moss and trees. Toward the northern end of the ridge which forms the eastern crest a cairn marks the tip-top, and protects an A. M. C. record-bottle. While the Councillor busied himself with his barometer and his lunch, the writer inspected the registrations of our predecessors. It was Mr. A. L. Goodrich, of Salem, Mass., who placed the bottle there on August 3, 1881; and already Mt. Royce has therein a chronicle of seven pages. If we may, by the contents, judge of the pre-Appalachian times, four-footed visitors have outnumbered the two-footed, and of the latter the majority have been men and boys in search of blueberries. One party, probably surveyors, camping near the summit on August 23, 1881, "started two caribou 100 rods S.W. from the top." Farther on is the following record: "This is my fourth visit on this mountain since 1874. In 1881 I had the pleasure of seeing three bears." The ascent made by the Councillor and his secretary appears to be almost the only incursion of the tourist world since Mr. Goodrich took possession of the mountain in the name of the Club; but it is safe to say that Royce will not always be left to the bears and other berry-hunters, for, beside its own beauty of structure, it is a fine view-point.

The sky, in which the clouds had thickened until noon, was now clearing, and the transparent atmosphere allowed us to see all. West and north spread the broad, dark wilderness, cheered by an occasional gleam of the boulder-strewn Wild River, sweeping out to the Androscoggin interval, of which we could see two pale-green bits between the hills. Enclosing the wilderness on the farther side, rose the majestic wall of the Carter-Moriah Range, with Mts. Washington, Adams, and Madison showing above it. Jefferson is seen from the western head only, if the writer may trust an observation made when these higher peaks were partly wrapped in cloud. About N.N.W. shone the ghostly twin peaks of Stratford, — Bowback and other neighbors in the background, — and then to the right the sea of northern mountains, among which the most familiar to us were, in order, Baldcap, Ingalls, Goose-eye, "Old Spec.," Robinson's Peak, Bear River and Sunday River Whitecaps, Puzzle, and Mt. Blue. The ledgy extension of Royce shut off the valley of Evans Brook

and the northern approaches to the Notch; but yonder stood the fine forms of Caribou and Speckled Mountain, the spreading mass of the latter being simplified into a decided peak with shoulders enclosing a ravine. Now came the wide plain with its myriad ponds, from the near Kezars to distant Sebago, rivalling the lake views from the mountains of Sandwich and Waterville. Between Kearsarge and Baldface the peaks of Moat and Chocorua appeared in line, their fantastic outlines blending strangely. W.S.W. the slopes of Baldface and the west peak of Royce framed in one little glimpse of the more southern mountains; conspicuous among them, Osceola and the North Peak of Tripyramid.

After one short hour thus divided between the view, the aneroid, lunch, and the record-bottle, at 1.53 we girded ourselves to surmount the western head. The col between the heads is thickly wooded to the edge of the wall over which pours a copious stream down to the valley. As well as we could judge, looking down from above, the forest here is broken only by one or two patches of open moss, known to us as "deer-pastures." We reached the col brook at 2.20, and then climbed the opposite side by a slide of immense fern-clad and forest-shadowed rocks fallen from the adjoining cliffs. Soon we stood where the highest cliff of all curved down in almost unbroken solidity for hundreds of feet, and thence a few steps over a cushion of moss, sheep-laurel, and Labrador tea placed us, at 3.01, on the *true summit* of Royce.¹

Our last conquest delighted us especially as a point of near observation for North and South Baldface and the beautiful ledgy ridge stretching thence directly toward us. Several mountains were here added to the southwestern view: Kancamangus, Tecumseh, Carrigain over Giant Stairs, Hancock over Lowell or Nancy.

All too soon, at 3.35, we must start on the home track. We kept on the ridge running S.W. for perhaps half a mile, nearly to where it slopes into the "Basin;" and then, following an eastward trend of this shoulder, we gradually descended, as directly as the cliffs allowed, and gained the clearings at 6.15, — Chandler's, an hour later.

Such are the results of a single day spent upon Mt. Royce; but the explorers feel that this interesting mountain deserves a much longer study than they were able to give. The present historian would be glad if Mr. Goodrich or others would enrich the Club with additional information respecting this region. Especially we should like to know whether "Blanchard's Basin," mentioned by Osgood's Guide, has any connection with "The Basin" or "The Great Basin" between Mts. Royce and Meader.

In regard to the ascent of the east peak of Mt. Royce, the following route, indicated by Mr. Chandler, appears to be the easiest and most direct. From the upper pasture through which the Notch trail passes,

¹ By aneroid measurement made that day, and hence only approximative, this western crest is 3,333 feet above the sea; the eastern head is 3,229 feet, thus leaving a superiority of 104 feet to the former. The stream where we crossed it, some distance below the height of the col, is 738 feet below the true summit.

a footpath diverges obliquely to the Cold River. Ascending the stream a mile or more, one meets the large tributary flowing from the col between the heads of Royce. This branch should now be one's guide nearly to the foot of the wall over which it leaps to the valley. Between this wall and the precipitous face of the east peak one should climb the green alley which leads directly to the desired summit. The distance given in the guide-book, $2\frac{1}{2}$ -3 miles, is probably true of this route. The Great Cold River is a charming brook; and all lovers of woodland beauty will be repaid for tracking its course up into the Notch, especially if they should chance to have a *penchant* toward the study of ferns, which grow here in the most luxuriant variety. The amateur of rocks will also find Mt. Royce an attractive locality. The explorers, in all their haste, could not but notice generally the beauty of the large, highly crystalline masses of quartz, feldspar, and mica, and at the Diamond in the Notch indications of more varied mineral wealth.

Passing over the southerly end of Mt. Royce and the "Basin," the eye falls upon Mt. Meader, a rounded elevation forming the connecting link between Royce and the north peak of Baldface. The said north peak is known in the Chatham valley as "Baldcap." The name is especially appropriate, as it rises an apparently small, bare, rounded eminence (like a skull-cap) above the surrounding forest. Unfortunately there is another and a more widely known Baldcap in the Androscoggin valley.

The distance between the north and south peaks of Baldface was estimated at a little over a mile. The growth on the connecting col is not difficult to pass through, and it is probable that Mr. C. Chandler or some of the sojourners at North Chatham will ere long see that a pathway is cut across.

There are two ways of ascending Baldface from Chandler's. The most usual one is by a logging road which crosses the Russell Charles brook eleven times; then, near an excellent spring, a pathway leads off to the left (in ascending), and continues until the great bare eastern shoulder of the mountain is reached. Thence the way is clear to the top of the south peak. The distance from Chandler's to this summit is about four miles; time required by an ordinary walking party, three hours.

The other route up is by the roads worn in the carriage of stone from the face of the mountain. The tracks of the said roads are visible from the highway, and when they end a little judgment in the selection of the easiest slopes up the wooded front will soon bring one out on the same bare eastern shoulder. This way is shorter than the first-mentioned, but would probably require from the ordinary climber about the same time, and perhaps more exertion, as it is steeper.¹

¹ When Mr. Cook went over the two peaks on the 2d of August, he found the southern to stand (by aneroid barometer) about 3,643 feet above the sea. The northern one stood at 3,711 feet, thus making its elevation 68 feet greater than that of its better-known companion. As a thunderstorm was at hand, it may be that this observation needs correction under more favorable conditions.

When the pathway between the two peaks is cut, it will be a very easy matter to visit both summits. Mr. Cook left an Appalachian record-bottle in the cairn on the top of the more frequented summit. He purposed coming down over Mt. Meader, thus completing the tramp over Royce, Baldface, and connecting ridges; but a thunder-storm, with low clouds, had meantime obscured the tops of the heights, rendering the undertaking unadvisable from any useful point of view.

Baldface is visible from so many of the White Mountain eminences that it, in turn, embraces a very extended prospect. To the visiting party of August 1st the most interesting view was that over the two heads of Royce, over Speckled Mountain, and up through the Evans Notch closed in by Mt. Caribou. One of the ladies (Miss Barstow), who on that day visited also the northern peak, pronounces the prospect thence down the Wild River wilderness, and over to the "backs" of Carter Dome, Carter Mountain, Imp Mountain, and the three summits of the Moriah range, especially beautiful.

From three to four days were given to the exploring tour from the Ravine House to North Chatham and back again. The result of the experiment was in every way charming, and the excursion is one that can be recommended from every point of view.

A PARTIAL EXPLORATION OF MT. WILDCAT. BY MISS M. M. PYCHOWSKA.

WHEN viewed from the Great Peaks or from the Peabody valley, the mountain range lying between the Carter and Pinkham Notches appears divided into two masses. The crowning point of the range is that which caps the abrupt western wall of Carter Notch. From this point a high ridge runs out southwestward, bearing two lesser crests. After the second of these crests, the ridge falls away into a hollow formed by the approximation of branch ravines from the Peabody and Wildcat valleys. Beyond this break in the mountain mass lies the wide-spreading group of lower heads adjacent to the Pinkham Notch.

On September 6, Mr. Cook, with four followers, made a partial exploration of the northeastern part of Mt. Wildcat. The explorers took the Glen path to Carter Notch, and left it at the crest of the divide, to climb directly up the backbone of the mountain. No cliffs forbade their advance; and after the scrub district in the Notch had been passed through, the growth was sparse, and the way, though steep, was easy. From the path a leisurely climb of one hour and seventeen minutes placed the party on the highest summit (M. 1, 1). As the tall trees obstructed the outlook thence, a view-point on the eastern slope was sought, and found only 45 feet below the crest. There, pushing aside the tough firs, we stepped out upon a noble cliff overlooking the Notch. More than 1,000 feet below us

The two ravines, Huntington's and Tuckerman's, exactly balance each other at equal distance from the smooth crowning dome. Out of these shadowy recesses the watercourses, like deeply marked veins, converge toward the dividing line of Raymond's Cascade. The Gulf of Slides and the New River may also be studied as on a map; for the intervening part of Wildcat is too low to offer obstruction. The following list presents the result of a rather hasty survey of the remaining horizon: South of Boott's Spur, the first thing descried was a portion of the Lafayette Sierra; then, in order, Field, Guyot, Bond, Willey, Flume, Moosilauke. Looking down the long, open valley of the East Branch, the eye rested on Big Coolidge and the ridge of Moosilauke running out to Watnomsee. To the left of this opening the mountains again clustered thickly: Hitchcock, Hancock, Carrigain over Nancy, Osceola, Tecumseh, Giant Stairs, Kancamagus, Resolution, Jennings' Peak peeping out from behind Tripyramid, which in turn appeared over Tremont, Parker, Whiteface and Passaconaway over Silver Spring, Pangus over Bear, Chocorua over Iron, Ossipee, Moat, Kearsarge, Doublehead, etc., to North and South Baldface. The rounded mass of M. 1, 1, cut off our view to the northeast. Between this obstruction and the slope of Madison was embraced a stretch of the Androscoggin valley and distant mountains, among which the Percy Peaks shone conspicuous. The view of Mts. Madison and Adams is perhaps as fine as that from Carter Dome, but Jefferson is partially eclipsed by the shoulder of Mt. Washington. Neither the low-lying beauties of the Jackson Valley nor the conformation of that part of our mountain spread below us to the southwest, received from us the attention it deserved. There were marks upon the low trees about our rocky observatory, indicating that others had been before us in the enjoyment of the splendid prospect. Our leader also thought that he discerned a shadow of a trail descending toward the Wildcat valley.

At 3.14 we reluctantly turned our backs on Mt. Washington and struck down the easterly slope, aiming obliquely for the path from Jackson. After one hour and twenty-one minutes of somewhat rough, obstructed travelling, we gained the path at a point over a mile south of the Notch. Fifty minutes more brought us to the divide, whence a rapid descent was made to the Glen House. Here we rejoined the pilgrims from G. 6, 2, and all climbed merrily into the wagon for the home drive to Randolph.

The result of aneroid readings made on this excursion tends to show that the height of Wildcat summit (M. 1, 1) may be somewhat more than 4,350 feet, the received figure. M. 1, 2, the grand view-point, is not quite 150 feet lower. The distance between the crests is about one mile, the lowest depth of the intervening depression, when crossed by a direct course, not being more than 200 feet below M. 1, 2. For persons approaching the mountain from the Glen side, the way of our ascent is at once easy and direct. By this route a good walker would require, from

the Notch, somewhat more than one hour to reach M. 1, 1, and under two hours for the whole distance to M. 1. 2. It is hoped that a path will soon make this wonderful view still more easy of attainment.

A VISIT TO THE IMP FACE. BY MISS S. M. BARSTOW.

ONE of the best known of the many curious and interesting rock forms in the White Mountains is the Imp Face, a weird profile of rock rising far above the Glen road, two miles to the north of the Glen House. Overlooking a deep ravine, and in a position to command a fine view of Mt. Washington and his neighbors, and having no path as yet to its summit, it presents an attractive field to the mountain explorer. Starting one morning in October from the Ravine House, with Mr. Laban Watson, we drove to Mrs. Copp's, near the bridge over the Peabody River, on the old Pinkham road, where we left our team, and, walking to the Glen road, entered the woods by a logging way, a few feet to the south of the meeting of the roads. Following that to some logging camps, and, in the many routes branching in every direction, always keeping the one that led directly to the Face, which loomed up before us in strong relief against the sky, we reached the end of the travelled way in about twenty minutes. Then, having taken the direction by compass, E.S.E., we climbed the mossy side of the mountain spur, which is very steep, but, having little undergrowth, is open and easy, and leads quickly to the rocky masses that form the profile.

They are bold, projecting rocks, jutting out irregularly, with here and there a tree trunk burnt by fire or twisted by winds. A growth of short, tough spruces forms a railing by which one can climb along the extreme edge with safety, though an occasional look down the vertical sides of the rocks might make one choose the inner side of the rail. Each advancing step presented new and picturesque foregrounds of jagged rock and gnarled, weather-beaten trees; and the Profile had resolved itself into many crags, forming as many fine view-points, and leading to the highest mass, the forehead, which stands out boldly, like a great buttress, — bare but for the lichen that covers its surface, and one tiny vine that has crept along a narrow crevice near its edge. The upper surface inclines slightly downward, making the one who stands on its point feel that he has earned the glorious view there obtained. The broken and almost vertical sides of the wall give an impression of great height, and add much to the grandeur of the scene. Below, is the great Ravine of Carter Mountain. To the left, the east wall of the ravine rises steeply, broken by a rock-bordered stream which leaps down its sides, — at the time of our visit a glittering mass of ice. Above, is the long ridge of Carter Mountain; farther on, rises the abrupt peak of Wildcat; then follow the great masses of Washington, Clay, Jefferson, Adams, and

Madison, with their magnificent ravines; thence on to Pliny and more distant peaks, round to Crescent on the right. From there we continued our course through the forest, near the edge of the ravine, finding only one other fine view-point until we reached the stream flowing through its centre, where the outlook was very beautiful, comprising less than that from the Face, but more picturesque as a whole, and giving the Imp Face itself in all its distinctness of outline as a prominent object in the middle ground, with great birches, spruces, moss-covered rocks, and sparkling brook in the foreground. Crossing the stream, we continued our course, and, keeping as close to the edge of the ravine as was safe, we came out upon a mass of rock which had shown finely from the opposite side, and commanded a fine view, the Imp always giving countenance to the scene. Following the southern wall, we descended rapidly to its base, and followed the brook, which gave many and varied picturesque bits, with its huge moss-and-fern-covered boulders and overhanging trees. Again we came upon the logging-road, which led us out to the starting-point, the whole excursion having occupied about two and a half hours, and combining as much beauty and variety as it would be possible to crowd into the same space of time, with no difficulty or fatigue.

AN ASCENT OF MT. HAYSTACK [GARFIELD]. By E. B. COOK.

THE conical peak of Mt. Haystack, seen from Sugar Hill, seemed to exert a peculiar magnetic attraction upon the writer in the year 1878, when he was staying at the Goodnow House. On consulting Osgood's Guidebook, it was found to say of "the Haystack," that "it is doubtful whether it has ever been explored, since the way thither is surpassingly difficult, leading through long unbroken thickets of dwarf spruce." The predicted difficulty of the way and the isolated character of the peak served to increase one's desire to reach the secluded spot. An ocular reconnaissance was made from the top of Mt. Lafayette, and the line of approach was determined. Inquiries were made as to whether the Haystack was indeed as untroubled as represented. One of the old residents of Franconia said the correct name of the peak was "Mt. Hooket." Rumor told of a party of students who had made the ascent, and had called the peak after their Alma Mater, "Mt. Harvard." The narrator, having spoken of the route he purposed to undertake, soon had the offer of a goodly company of volunteers. For many days the weather was unpropitious, and a very smoky atmosphere further delayed the starting of the party; but late in August, one morning at six o'clock, six well-equipped mountaineers left Sugar Hill in one of Mr. Goodnow's wagons, bound for the path which leads up Mt. Lafayette from the Profile House. The party consisted of the Rev. H. G. Spaulding, Prof. E. P. Gould, Mr. Ellis Seymour, Mr. Harry Cumner, young Mr. Harry Wadleigh,

and the writer. About two hours were required to reach the Lafayette path, where we all donned our packs, which were rather cumbersome, as they included wraps, rations, and several axes. We stood on the summit of Lafayette at a quarter of twelve ; and a few minutes later the narrator took an observation with his aneroid barometer. At the well-known spring, a little north and east of the summit, we dined, and rested awhile.

We left the spring at a little before one o'clock, our route being north and east, down ledges and piles of rock, endeavoring to select the fittest. Some steep descents could not be avoided. Farther along, the way consisted of stretches of rock and thickets of scrub spruces, which could mostly be flanked on one side or the other by zigzagging along the rocky stretches. Looking back, one was greatly impressed by the massive structure of Mt. Lafayette. Sometimes it was imperative to pass through the serried ranks of scrub spruces, which stood with open arms to receive us and to prove their strong attachment. Much labor had to be undergone, especially owing to the burdens we bore; but the difficulties of the way did not at all equal our overwrought anticipations. Where there were no stretches of rock, the trees were of sufficient height to shut in our view, so that it was necessary to travel by compass. A north-easterly course was kept, but detours were made that promised advantage. We reached Haystack Lake at five minutes past four. The entire distance travelled from the summit of Lafayette must have been nearly three miles.¹

The leader's desire to proceed immediately to the top of Haystack was overruled, and a camping site was chosen on the branch of the Gale River, which flows from the lake, and soon the echoes of our axes were ringing through the woods. Shortly after our fire was built and supper was being prepared, the sound of voices was heard, and soon three figures came within hail. They proved to be pedestrians from Bethlehem, who were on their way over the mountain on a fishing excursion down the East Branch of the Pemigewasset. One of the men was a "painter," and naturally seemed to feel much at home in the wilderness. After a short parley, the fishermen set to work preparing their camp, a little

¹ In his "Geology of New Hampshire," Professor Hitchcock says: "Between Mts. Lafayette and Haystack there are three elevations, whose character may be conveniently mentioned here. Lafayette itself is composed of porphyry at the very summit. The long northwesterly spur from it has the same character. The first eminence towards Haystack is composed of gneiss connected with the Franconia breccia. Specimens of granular quartz illustrate the second. The third is composed of Bethlehem gneiss. Haystack itself seems to belong to the Albany granite layer. Specimens from these three summits were collected for us by Messrs. Smith, Hoitt, and Conant, of the Dartmouth party of 1871; and the trips taken to find them were very laborious. It is supposed that the Albany granite is continuous from Haystack to the north slope of Twin Mountain; but this theory has not been verified by actual perambulation."

way off from ours, across the brook. Our supper was very refreshing, especially the delicious coffee tempered with sugar and condensed milk. After supper one of the fishermen came over, by the light of a birch-bark torch, to inquire as to his best route; so before him was spread Walling's Map, illumined by a sperm candle, and the desired way was quickly made clear. The rotation of our watches was duly arranged, and the watch-fires of both camps sparkled brightly throughout the night. Both camps might have been more quiet, and have allowed each other to realize the charms of solitude; but restlessness was evoked by the fumes of strong coffee and the spirit of devilled tongue, so that repose was obtainable only in fragments. After breakfast we lightened our burdens by presenting sundry packages of eatables to our friends, who were going to whip the East Branch more wisely than did Xerxes the Hellespont.

The two parties bade each other a friendly adieu; and the fishermen started for the East Branch, while the mountaineers set off on their way up the Haystack. We soon came upon evident traces of previous visitors; and, the distance being only about half a mile, we shortly were able to emerge from the last stunted growth and stand upon the desired crest. A pile of rocks, surmounted by a staff, greeted our sight. It took us just thirty-three minutes from the lake to the summit. The crest of Haystack is small, and is composed of huge masses of rock of angular forms. The side of the mountain leading down to the East Branch is very steep; and the view of the valley below is striking, looking over towards Mts. Hancock and Osceola. The noble line of the Twin Mountain Range stands near at hand, and Lafayette rises aloft in majestic grandeur. A thick smoke obscured the distant views. After enjoying the prospect for a considerable while, and studying our map, we started homeward, soon reaching the lake.

In Professor Hitchcock's "Geology of New Hampshire" it is said that, in 1871, "Messrs. Conant and Smith were so fortunate as to discover a new lake on the northwest side of Haystack Mountain, which we christened Haystack Lake. It is a parallelogram in shape, fifteen rods long and half as wide, with rather shallow water,—forming the head-waters of the Gale River, 3,787 feet above tide-water, as determined by the aneroid barometer." My measurement makes the lake 29 feet higher above the ocean; and the summit of Haystack 630 feet above the lake,—that is, having an altitude of 4,446 feet. The result of my calculations indicates that Haystack is about 800 feet lower than Lafayette.

At half-past nine o'clock A.M. the narrator started to lead the party down the east side of the branch of Gale River, which flows out of Haystack Lake; being careful to keep near enough to follow the course of the stream, and far enough away to secure good travelling ground. A little below the lake the way was somewhat steep, but nothing to compare to the buttresses of Mt. Lowell. We stopped to admire one handsome waterfall on our way down the stream; and soon afterwards came upon a wood-road, which, not following the brook, led us out of the wilderness

to a dilapidated bridge of noble proportions, not far from which, if I remember rightly, were the remains of a venerable saw-mill. But two hours and a half were taken in coming from the lake to the bridge. The distance from the top of the Haystack to the Gale River bridge must be less than four miles and a half, and this route would be a very good one for making the ascent. Having crossed the disjointed old bridge, we came upon a road which led along the Gale River for some distance, and then joined the highroad from Bethlehem to Franconia. At a quarter after five o'clock P.M. the party was safely back at Sugar Hill, — *sweet* home!

A WALK OVER MTS. DECEPTION, DARTMOUTH, AND MITTEN. BY
GEORGE A. SARGENT.

ON Friday, Sept. 21, 1883, a party of six — Messrs. E. B. Cook, of Hoboken, N. J., Councillor of Exploration; A. S. Eddy, Albert Matthews, J. P. Clark, all of Boston; Charles E. Lowe, of Randolph, our guide; and the writer — left the Ravine House in Randolph to take the above-mentioned tramp. We started at 8.03 A.M., and drove through Jefferson Meadows and over the Cherry Mountain road to the point where a carriage-road labelled "Mt. Deception" — a road said to be somewhat frequented by the more hardy of the tourists from Fabyan's — makes up a knoll of this mountain. We arrived at this point at 11.45, strapped on our packs, and began our walk at 12.02 P.M. We arrived at the end of the carriage-road at 12.27, and allowed ourselves eleven minutes in which to get the view, obtain our barometric observation, and to settle as definitely as possible what was to be our line of march.

Mr. Cook's calculation (aneroid barometer used) makes the height of the base of the cairn at the end of the carriage-road on this outlying spur, 2,374 feet. Professor Cross gives the elevation of the "Signal on Spur of Mt. Deception, opposite Fabyan House," by aneroid measurement, as 2,193 feet; Professor Guyot, by mercurial barometer, makes the height of "Mt. Deception," 2,499 feet. It is possible that Professors Cross and Guyot did not take their observations from the same point as Mr. Cook.

Having decided that northeast by north and a half east was to be our general course, we walked down in the proper direction, and through an open wood, till at 12.57 we reached a brook. There we lunched till 1.30. From this time we had up-hill work. Every height we attained we all asserted was the highest, and nearly every time we found ourselves mistaken. The first shoulder of the southwest peak of Deception was reached at 2.15. The height measured 3,056 feet. At 2.35 we came to the next summit, 3,150 feet in height. Shortly after this another, 3,160 feet high, was reached. On this were many large spruce and birch trees. We amused ourselves by climbing several of these, whence we obtained

a fine and extended view. Fondly imagining this to be the highest summit, we cut eight conspicuous blazes on a tree. Leaving this point at 3.52, we continued to ascend till at 4.10 we were on a top having an altitude of 3,653 feet. Here we placed four spots on each of two trees. This, by a course of subsequent reasoning, we demonstrated to be the true summit of Mt. Deception. At 4.16 we began the descent of the depression between Deception and Dartmouth, and at 4.32 arrived at a small brook. Although this only made itself occasionally evident through the moss, we managed to extract enough water to cook sufficient Indian mush for six very hungry men, and here we necessarily camped. The height of the camp above sea-level was 3,288 feet. Having but one axe in the party, we wasted no time in preparing a shelter, but constructed a most comfortable spring bed of moss and spruce boughs, and cut an abundance of wood. After having partaken of a hearty supper, we threw ourselves down on our couch, our feet towards an immense fire, our faces upturned towards the stars above.

Saturday, September 22. Clear; wind, N.W.; temperature, at 6.30 A.M., 49° F. Breakfasted on canned salmon, bread and butter, and maple sugar. Broke camp at seven o'clock. Course, nearly north till the highest peak of Dartmouth was reached; thence nearly due east to the summit of Mitten. The climb from the camp to the top of the first peak was very steep, and through thick scrub. The first peak of Dartmouth was reached at 7.20. According to our habitual custom, we regarded this as the highest summit, and consequently placed six blazes on a tree there. Height, 3,499 feet. We left at 7.35. At 7.39 we ascended a higher top; at 7.55, one still higher; and at 7.56, one higher yet. On this last we confidently blazed a triangle of three trees, one spot on each tree. At four minutes past eight another was reached of still greater altitude; height, 3,590 feet. It is marked by five blazes on each of two trees. This was the true summit, much to our surprise. We left at 8.09, and went down the depression between Dartmouth and Mitten. At 8.30 we crossed a small brook; at 8.38, we arrived at the bottom of the depression. Height above sea-level, 3,071 feet. At eleven minutes past nine the first peak of Mitten was reached; summit of Mitten reached at 9.40; height, 3,674 feet. Here Mr. Lowe felled a tree, and on the stump our much-enduring mush-pail—inscribed with our six names—was firmly fastened. The stump was blazed with a single spot on two sides. On Dartmouth and Mitten at various points sundry trees had been climbed in order to get a view, but at such points as admitted any outlook we found the atmosphere so smoky that we could see but a short distance. At 10.05 we left the summit of Mitten; struck Stilling's Path at 11.30, and followed down till 11.47. At nine minutes before twelve we reached the south branch of Israel's River, where we dined. Height, 1,580 feet. From here we went up Round Mountain, which we reached at 1.07, — height, 2,766 feet, — and thence to the top of Bowman, — height, 3,406 feet; according to Mr. Pickering, 3,480 feet. Mr. Cook's barometer was said to be corrected for hyperbole. We never

found that he overestimated any height. We reached Bowman at 2.35 P.M. Left at 2.59, and, descending, arrived at the Bowman Place at 4.09, and the Ravine House at about a quarter past five.

Distance walked (estimated): First day, 3 miles; second day, 12 miles.
Time (exclusive of stops): First day, 3 hrs.; second day, 8 hrs.

Looking a little to the west of north from the summit of Mitten, the Thumb was seen. About due east from the Thumb of the Mitten there is a height which the natives call "Mitten." This Little Mitten, as we will call it, could not be seen by us from Mitten proper, — possibly on account of intervening trees, — although it is connected by a ridge with the true summit. It is much lower than Mitten, from which it lies in a northerly or north by east direction. The true Mitten is frequently (generally by the inhabitants of the region) spoken of as Dartmouth, while Dartmouth itself is styled Deception.

AN ASCENT OF MT. NANCY. BY ALBERT MATTHEWS.

On Thursday, Sept. 27, 1883, Mr. E. B. Cook, Mr. G. A. Sargent, and the writer left Upper Bartlett at 7.30 A.M., and drove to Bemis, six miles. Leaving our horse and carriage at that place, we started at 8.42, and, striking across a field and by a logging-road, in ten minutes reached Nancy's River. Our intention was to follow this to its source.

Continuing up the bed of the brook, we found the walking easy, over good-sized rocks, and not steep, but rather monotonous. In one hour and thirty-three minutes we came to a fork in the river, one branch coming from the northwest and the other from the southwest. Taking the right-hand branch (or the one coming from the northwest), three minutes brought us to a lovely fall. The water, from a thin strip of not more than four or six inches at the top, expands into a broad surface of fully fifteen feet. Climbing up the bank, we had no sooner reached the supposed top than we found it to be the bottom of a fall of equal height, — a slight projection of rock preventing the real top from being seen. The combined height of these two falls was 197 feet. Leaving this place at 10.30, seven minutes brought us to another fall of from 50 to 60 feet in height. From the top of this fall, a pretty, though limited, view is had, including, over the left shoulder of Giant's Stairs, Wildcat and Carter Dome; then, in the foreground, Giant's Stairs, Resolution, Crawford, Parker, Gemini, and the northern Kearsarge (Pequawket). In a minute more, we came to still another fall, 25–30 feet high. From the first fall to this place the brook was extremely steep, and the rocks were very large. But after reaching the top of this fall, the steepness came suddenly to an end, and for the next twenty minutes the ground was almost level. Then again we passed

more falls, but none exceeding 20 feet. From this point, too, the character of the rock changed. The bed of the brook, instead of being made of large fragments, as hitherto, was now composed of ledges of broad brown rock, similar to the Ripley Falls on Cow Brook. It is a pity that such a beautiful succession of falls should not be more visited: could not the Club have a path made to them? At 11.28 we reached Nancy's Pond. Time, 2 h. 46 m. (including eighteen minutes in stops) from Bemis; distance, three miles.

This pond, if filled with water, would cover about two and a half acres; but, as it was, only about half an acre was water. The soil is swampy all about, and deer-tracks were plentiful. The outlet is southeast. As it is enclosed by higher land on all sides, nothing can be seen from it.

Expecting this to be the last water we should find (in which we were not mistaken), and although it tasted somewhat of its surroundings, we here ate lunch. At 12.30 we started for the summit, taking a westerly course. In seventeen minutes we came to a place which we thought might be the summit; but on climbing a tree we saw higher land to the southwest; so, at once moving on, we reached the summit of Mt. Nancy at 1.01. Time, 24 m. (exclusive of seven minutes' stop on the intermediate peak) from the pond; distance, one-half mile.

The summit is covered with spruce-trees; but on climbing a tree we had a superb view. The features of the view are twofold: first, the view of Carrigain, with its steep ravine formed by "Burnt Hat Ridge" and Vose's Spur; and, secondly, the Crawford Notch, with the dark mass of Willey on the one side and the long red flank of Webster on the other; while between them is seen the rocky Willard, and over Willard are the thickly wooded Deception Range and Cherry Mountain. Nor is it necessary to climb a tree in order to get the view. The summit is a little hump, sloping off steeply to the east and precipitately to the south. By moving ten feet to the east a view can be had extending from Willey to the northern Kearsarge; and by going about one hundred feet to the south, one can see from North Moat to Lincoln.

There is much confusion in regard to the height of Nancy, and of its neighbors, Anderson and Lowell. Professor Hitchcock gives 3,850 feet as the height of Lowell. Anderson is always put down as 4,000 feet, and Nancy as 3,800 feet. These figures are, at least, doubtful. By his aneroid barometer, Mr. Cook found Nancy to be 3,924 feet high, and this figure is, if anything, below rather than above the mark. Regarded from both Parker and Carrigain (which we ascended on the 26th and 28th, respectively), and from Nancy itself, Nancy is higher than Anderson. Then, again, Nancy's Pond is, on Walling's map, between 2,700 and 2,800 feet. Its real height is only about 550 feet below the summit of Mt. Nancy. Moreover, its position is wrong on this map. Mt. Nancy has two peaks: the lower peak east of the pond; an intermediate shoulder leading up to the summit, but with no depression between it and the summit; and then the true summit. The pond lies between the lower peak and the inter-

mediate peak. From the summit the lower peak is N.E. by E.; that is, just in line with and under Giant's Stairs.

At 2.35 we left the summit of Mt. Nancy. Taking an easterly course, twenty-three minutes brought us to Nancy's River. Crossing the river, we kept on our easterly course until we again came to the river, considerably below the falls, at 3.35. Keeping to the bed of the stream from this point, at 4.23, after an easy walk of one hour and forty-eight minutes, we reached Bemis; and an hour's drive took us back to the Bartlett House.

Before leaving the summit of Mt. Nancy, we blazed a tree with a pen-knife, and placed a record-bottle in the fork of one of its branches.

ASCENT OF MTS. LANGDON AND PARKER. BY ALBERT MATTHEWS.

ON the morning of Wednesday, Sept. 26, 1883, Mr. E. B. Cook, Mr. G. A. Sargent, and the writer left Upper Bartlett at 8.56. Taking the road which crosses the Saco a few rods back of the Bartlett House, we turned to the right, and then, crossing a field on the left of the first house, we came to a small brook, which we followed until we reached an old dam. Crossing the brook at this point, we found ourselves on the path up Mt. Langdon, twenty minutes from the Bartlett House. When once found, the path is easy to keep and easy to travel, as the grade is low and the way leads over bare ledges and through sparse trees. Near the top we passed over several stretches of disintegrated rock appearing like gravel. At ten o'clock, sixty-four minutes from the Bartlett House, we stood upon the summit of Mt. Langdon. The path from the Bartlett House to the summit of Mt. Langdon is two and three-fourth miles. The summit of Langdon is partly wooded; but by climbing a triangular-shaped structure, built for the purpose, a fine view can be had. This view is described in Osgood's Guide, p. 128.

Leaving Mt. Langdon at 10.42, we took a northerly course, so as to strike the southeasterly ridge of Mt. Parker. Our way lay through an easily traversed forest of maples, beeches, and birches, with here and there some juniper; and, assisted by a logging-road, we reached the depression between Langdon and Parker at 11.03. Here we found water, — a little brook, running northeast. Continuing on our way, in twenty minutes we passed a huge boulder, and ten minutes later three more boulders, and at 11.57 — one hour and fifteen minutes from Langdon — we were on the summit of Mt. Parker. The distance from Langdon to Parker is two miles.

This summit proved to be a flat rocky surface of about half an acre in extent, with some low spruce at one end and a large rock on the other side; but there were no obstructions to the view, which is indeed fine. Almost all of the principal peaks of the White Mountains can be

seen; and, so beautiful is the view in every direction, it is wellnigh impossible to say which appear to best advantage. But perhaps the palm will be conceded to the mountains which fall into the Saco valley and to the Presidential Range. There had been a snow-storm the previous night; and the snow-white of the Presidential Range, the long, reddish, rocky side of Webster, the dark, towering hump of Willey, and the rich foliage of Crawford, surmounted by its curious peak, combined to make a picture not easily forgotten.

I wish to speak of two things in regard to the view from Mt. Parker: first, that Sandwich Dome [Black], being directly back of Tripyramid, cannot be seen at all, but that Osceola, which has on its right side a projection somewhat resembling Jennings's Peak, can be seen; secondly, that Mt. Lowell, being in exact line with Carrigain, cannot be seen except by a very sharp pair of eyes, and when the sun has got well around towards the west. Between Vose's Spur and Mt. Nancy, Anderson looms up distinctly; and to the right of Anderson, the two thickly wooded peaks of Nancy are visible. Then, to the right of Nancy, are seen Lafayette, Bond, Guyot, etc.

Here we ate our lunch. And now, with a fresh northwesterly wind blowing, and with the thermometer at 42° , we were glad enough to use the shelter afforded by the low spruce. There is no water to be had on the summit, unless one is fortunate enough, as were we, to find some rain-water lodged in the crevices. After lunch, we built two cairns, — one on the highest point, and the other on the large rock already mentioned. This was easy work, as there is an abundance of loose rock and stones on the summit.

At 2.25, after a most delightful stay, we left Mt. Parker, and, taking a southerly course, at first found the walking rather rough, as the slope was quite steep and the stones were very loose. However, ten minutes brought us to open woods, and twenty minutes more to a logging-road; and in fifteen minutes more we were by the side of a brook. Without crossing this, but keeping to the logging-road (though rather wet), at 3.30 we stood on the bridge crossing Razor Brook; and we finally reached the Bartlett House at 4.08, — just one hour and forty-three minutes from the top of Parker, or a distance of about four and one-fourth miles.

By Mr. Cook's aneroid barometer the following figures were obtained: Mt. Langdon, 2,424 feet; Mt. Parker, 3,015 feet. Mr. W. H. Pickering gives 2,460 feet as the height of Mt. Langdon. It is certain that Mr. Cook's figures are not too large.

Through a misunderstanding, Mr. Cook left his record-bottle at Bartlett; but on the following Saturday he ascended Parker for the sole purpose of placing it there. This time he made the ascent by way of the depression between Willoughby Ledge and the outlying shoulder of Langdon, ascending Parker on the south side. Time, 2 h. 17 m. It took us, going over Mt. Langdon, 2 h. 19 m. Thus it will be seen that, as regards time, it is immaterial whether one goes straight up Parker or by way of Langdon.

THE GIANT'S STAIRS. BY R. B. LAWRENCE.

IN connection with the Field Meeting at North Conway an ascent was made of Mt. Crawford; and two of us, members of the party, extended the trip to the Giant's Stairs. We left the summit of Crawford at 12.50, descending very rapidly the steep cliffs, and bearing to the left of the col which connects Crawford with Resolution. We had been told that there was a deep ravine to cross before reaching the Stairs, and therefore we must not bear to the left too far. We failed to follow this advice; and, on reaching the summit of the ridge which lies between Crawford and Resolution, we saw before us a ravine so broad, deep, and thickly wooded, that we decided to skirt it rather than cross it. The best, though by no means the most direct, route from Crawford to Resolution is *via* the col from Crawford to the intervening ridge, over the middle of this ridge, and then *via* the col to the side of Resolution. If we had taken this route, I think we should have saved ten minutes. There are no thick woods, the ridge being rocky and the cols covered with long grass. It is advisable to skirt Resolution along its northwest side, as the summit is a considerable distance to the right, and so extensive and flat that the view would probably be unsatisfactory. It is equally desirable to skirt Resolution sufficiently high up to avoid the scrub, steep ledges, and precipices, and the immense banks of loose gravel. This, also, we failed to do; we aimed too straight at our mark. The finest view of the Stairs is from the north side of Resolution just above the col. There the cyclopean cliffs appear in all their grandeur, neither yielding to the other in effect, but both uniting, in equal degree, to produce one of the noblest features of the White Mountains. The "Guide to the Mt. Washington Range" gives the height of the lower stair as 200 feet, and that of the upper as 180 feet. We reached the col at 2.01, 1 h. 11 min. from Crawford. From this point the finest view of the lower stair is obtained, but the upper stair is not visible. After a short but sharp climb, we reached the upper edge of the lower stair at 2.16, 15 min. from the col, and the top of the upper stair at 2.28, 27 min. from the col and 1 h. 38 min. from Mt. Crawford. Not only was the view from the summit very fine, but the Stairs themselves were sufficiently interesting to repay us for our exertions. One of the striking features of the view was the great ravine which extended from the col at the foot of the Stairs down to Sleeper's Brook, and which opened to us a fine view of the Saco Valley and the Frankenstein Trestle. Beginning with the steep slope of Willey, the view presented the entire Twin Mountain Range, — the North and South Twins, Guyot, Bond, and the Cliffs on Bond. From these mountains our attention was immediately drawn by the peculiarly interesting appearance of the Lafayette Range, which, like the edge of a saw, rose above the Twin Range north of Bond. Over the wilderness of the East Branch appeared several interesting summits in the distance, prominent among which was Moosilauke. Next came Nancy, Anderson, Hancock, and Carrigain,

grouped closely together, the three former being dwarfed by the enormous mass of Carrigain, which in fact was the most impressive object visible from the Stairs. Then came Osceola and a distant peak which we did not recognize. Black, Tripyramid, Whiteface, and Passaconaway formed a very interesting group. Our attention was next arrested by the peculiar appearance of Chocorua, the sharp cove rising above the north shoulder. Then followed Moat, Pleasant Mountain in Maine, the conspicuous cone of the Northern Kearsarge, Doublehead, Eastman, and Baldface, and finally Carter Dome. Mt. Washington could be seen only by climbing a tree. A short distance to the east of the Stairs were two more Titanic Steps, a little lower than the ones we were upon, and forming a shoulder of the same mountain. We wished to explore them, but the immense wilderness of the Rocky Branch reminded us that there was a good number of miles between us and Glen Station. We left the summit at 3.25, and descended the ravine the head of which is at the col between Resolution and the Stairs. This ravine is well wooded, but we found it sufficiently free from undergrowth to enable us to make excellent time. The descent was at first steep, but after we struck water it became more gradual. We reached the Rocky Branch at 4.53, and then followed the stream until we struck the road on the left bank at 6.10. We arrived at Glen Station at 7, boarded a freight-train, and reached North Conway about 8 P. M.

A TRIP OVER OSCEOLA, THE TWIN MOUNTAIN RANGE, AND MT. GARFIELD. BY W. L. HOOPER.

EARLY in the summer of 1882, I planned with a friend a trip over Osceola and the Twin Mountain range. We started from Greeley's on the morning of July 4, ascended Osceola, and passed the day upon the summit. The next morning, we struck down into the great ravine on the north side of the mountain, and, at an altitude of about five hundred feet below the summit, entered the slide that forms the upper part of Pine Brook. This slide is easily seen from the summits of the Twin range and from some parts of the East Branch. We found the travelling rather difficult, the choice being between the steep rocky bed of the stream and the tangled growth and fallen timber above its banks. For the most part we chose the former. The journey was, however, not without its charms. The view to the northward, embracing the numerous summits of the Hancock group and the Twins, was very wild and grand; while beneath our feet the water jumped from rock to rock in a succession of diminutive cascades, or plunged perpendicularly downward over a huge ledge a distance of forty or fifty feet.

Pine Brook, where it enters the Hancock Branch, is not much smaller than the latter stream above the junction of the two. The fact that there is no stream entering the Hancock Branch from the southwest below

Pine Brook, may be of some value in determining the exact route of Captain Samuel Willard's march through this region in 1725.¹

During the whole trip so far the weather had been warm, with light rains, and the mosquitoes, midges, and black flies were so troublesome that we had been able neither to sleep nor to travel with any comfort. Even a smudge seemed useless, unless one stood directly in the smoke. My companion's face and hands were so badly bitten that it was several weeks before they resumed their normal appearance. At this point we accordingly decided to leave the woods, and at daybreak on the following morning were on our way to Pollard's.

Last spring I determined to return to Pollard's after the season of mosquitoes and midges had passed, and finish my previously undertaken trip by going over the Twin range and Mt. Garfield.

On the 26th of August, at about 1 P.M., I started alone from Pollard's up the East Branch. Two and a quarter miles brought me to the Clear Brook slide. This slide is said to have originated in five different places two or three miles back from the East Branch, presumably on Big Coolidge. It occurred on the same day with that which devastated the Flume.

Seven miles from Pollard's I found a very comfortable bark camp on the Franconia Branch, near Black Pond. From the Hancock Branch a blazed path leads up the northwest side of the East Branch directly to this camp. Here I passed the night, after a sumptuous supper on roast partridge, shot during the afternoon with my revolver.

The next morning, after a visit to Black Pond, which I found to be about five hundred feet higher than Pollard's, I continued up the Franconia Branch about one and a half miles, till opposite the spur that runs off nearly west from the Cliffs of Bond.

Here I left the river, and followed the ridge of this spur, encountering about fifty yards of bad scrub just before coming out upon the bare ledges above the cliffs.

After spending about an hour here, and eating heartily of the blueberries that were so abundant, I descended by the A. M. C. path eight or nine hundred feet, and camped in the bed of the brook, which in this place is about two hundred feet below the path, to the east. At the guide-board at the head of the path I left a tight tin can containing three or four pounds of dry oatmeal. This ought to be good next summer. Although sheltered from the cold north wind, I found the night disagreeably cool, the thermometer being but little above 40° F.

Of the trip over the Twin Range it will be unnecessary for me to speak, since it has recently been made by so many. I will, however, give the distances and the altitudes of summits and cols as determined by pedometer and aneroid. To my observations with the barometer I have applied all available corrections; but while I think the relative altitudes

¹ See Appalachia, II. p. 342.

can be depended upon within quite narrow limits, I am not so sure of the absolute altitudes.

ALTITUDES.

Cliffs of Mt. Bond	4,523 feet.	Mt. Bond	4,774 feet.
Col between Mts. Bond and Guyot	4,449 "	Mt. Guyot	4,674 "
Col " Mt. Guyot and South Twin	4,469 "	South Twin	4,989 "
Col " South and North Twins	4,469 "	North Twin	4,889 "
Mt. Garfield	4,469 "		

It will be observed, from an inspection of these figures, that the cliffs on Bond, the col between the summits of the Twin Range, and the summit of Garfield, all have about the same altitude.

DISTANCES.

From Mt. Bond to col between Mts. Bond and Guyot, .75 mile; thence to Mt. Guyot, .44 mile.
 From Mt. Guyot to col between Mt. Guyot and South Twin, .50 mile; thence to South Twin, 1.50 mile.
 From South Twin to col between South and North Twins, .85 mile; thence to North Twin, .44 mile.
 From col between South and North Twins to Mt. Garfield, 4.00 miles; thence to Mt. Lafayette, 3.10 miles.

The pedometer measurements of the Twin range are probably slightly in excess of the true distances. From the Twins over Garfield to Lafayette the excess must be considerable, perhaps twenty per cent.

I left the Twin range at half-past one, starting down the ravine to the west of the col between the two Twins. Some fourteen hundred feet down, the brook that has its origin near the col is joined by several smaller streams from the western spur of the South Twin. From this point I bore upwards in a southwesterly direction to the crest of the ridge connecting the South Twin and Garfield, and followed this till within about a mile and a half of the latter. Here I camped, and again ate roast partridge; indeed, during my whole trip I had no difficulty in shooting with my revolver all the partridges I wanted. All along this divide deer tracks and signs were very numerous; at one place the deer had made a well-beaten track, which I followed for some distance. The travelling, though not easy, was not especially difficult. Although the thermometer sank to about 40° during the night, the absence of wind enabled me to make myself very comfortable.

The next morning, in order to avoid a considerable elevation in front, I bore along the southern slope of the ridge, keeping at a nearly constant altitude. I soon discovered I had made a mistake in so doing. The fallen timber was scattered about in promiscuous confusion; and to add to this, the surface of the ground was composed of moss-covered boulders that had come down from the cliffs above, so that occasionally a leg would

slip down between them, while the other described a tangent to the earth's surface. In places the undergrowth of spruce was so thick that it was impossible to see two rods in any direction. I finally succeeded in reaching a gap in the ridge, through which I passed to the north side, where a quarter of a mile of easy walking through an open growth brought me to the foot of the cone of Garfield. Here I found excellent water. On this side, the mountain is very precipitous. I do not think the inclination of the eastern side can be less than 45°. I selected a place where the spring torrents had formed a slight depression, the bottom and sides of which were covered with bushes, and up this I climbed. It was hard work, but I finally accomplished it, and found myself within a few hundred yards of the top. Some rather ugly-looking scrub intervened, and I was perhaps half an hour in getting through this and reaching the flat elevated ledge that forms the summit. It was now ten o'clock. I had been three and a half hours in going one and a half miles. The view from Garfield is fine; still there is hardly anything to be seen that is not better seen from the Twins or from Lafayette. To me Garfield was chiefly interesting in furnishing a new view-point for "Owl's Head," as I have heard guides and fishermen call the range between the Red Rock Brook and Franconia Branch. From the summit I started down the western slope, making as nearly as possible a straight line for the summit of Lafayette. Little or no difficulty from the scrub was here encountered. After descending about twelve hundred feet, I bore round to the southern slope of the westerly spur, intending to follow this to the col northeast of Lafayette. Here I met with all the difficulties of the early morning. Henceforth I shall avoid southerly slopes in this neighborhood, for they are generally steep, and abound in moss-covered boulders and fallen timber. After much difficulty, however, the col was reached, and from this point the ascent of Lafayette was easy. The summit was attained at 3.40 P.M. At 4.00 I started down the path, and at 8.45 reached Pollard's, but not without a little adventure. About half a mile from Pollard's house, I met a bear in the road; but on my rather vigorously demanding the right of way, Bruin trotted off, and was seen no more.

Reports of the Councillors for the Autumn of 1883.

Improvements.

BY W. B. PARKER.

At the commencement of the summer season it was decided to spend the energies of this department chiefly in extending the path on the Twin Mountain Range, where so much was accomplished by our ex-Councillor, Mr. Scott, last year. As

this was a plan of his relating to a region with which I am not familiar, he kindly acceded to my request that he should continue his interest in it, and relieve me of the superintendence of the work. The plan has been carried out, and he has written an account of it, which is appended to this report.

Besides this work the Council thought it advisable to spend something upon the Waterville and Mt. Carrigain Paths, and on the Glen side of the Carter Notch Path, all of which were said to be considerably overgrown.

The labor on this latter path was mostly contributed by Mr. Milliken of the Glen House, he offering the services of his men, provided the Club would send some one there to instruct them in regard to the work. Mr. C. E. Lowe being chosen to attend to it, they cleared it out and straightened it somewhat, so that now it is reported to be in good condition.

The work on the Waterville and Carrigain Paths has not been done yet, the excellent woodsman employed to cut them not having found opportunity to begin the work. It will doubtless be done this autumn or in the spring, so as to be ready for another season.

There have been other valuable improvements made, by energetic members of the Club, in the regions about the Ravine House, in Randolph, Mt. Adams, and Carter Dome.

On Mt. Adams, Mr. William G. Nowell, assisted by his children, Miss Grace and Master Fred, and two lads, — Masters Walter and Howard Clark, of New York, — devoted a good deal of time to the remeasuring of the path from the slender spruce to the top. Hectometer signs of well-seasoned and painted pine were nailed all along the route, upon stakes supported by cairns of stones. Two large signs were erected at the camp, marked "Path." As now measured, the path is four and one eighth miles from the public road at Mr. Lowe's to the summit. They also measured 2¹/₂ of the distance on the new path opened from the Ravine House to the A. M. C. Camp on the Mt. Adams Path, temporarily marked the same, and prepared the signs for most of the way measured. For the entrance of this path, at the camp, a sign was put up marked "King's Ravine."

On September 7th, with much hard labor, they erected a

substantial observatory over the cairn on the summit of Carter Dome, that one can sit or stand upon, and which commands a view in all directions over the tree growth.

The new paths in the region of the Ravine House are described by Mr. Eugene B. Cook in an appendix to this report.

Six of the Club record-boxes were intrusted to the charge of Mr. Cook. Of these, he writes that one was placed on the top of Mt. Hale on the 23d of July; one on the summit of Baldface Mountain in Chatham, on the 2d of August; another on the north peak of Carter Dome on the 1st of September; one on Mt. Moriah, the 10th; one upon Mt. Nancy, on the 27th; and one on Mt. Parker, the 29th of September.

THE TWIN MOUNTAIN PATH. BY A. E. SCOTT.

It was stated in my last report as Councillor of this department, that the Twin Mountain Path would be cut to the South Summit in June of this year. That work was promptly and satisfactorily completed. The Council favored the extension of the path to the Cliffs of Bond, and made a partial appropriation therefor. At the request of the present Councillor I undertook the supervision of the work.

The parties who had explored the whole route with me, and who had cut the path to the South Twin, could not be induced to go on with the work, and I was forced to employ other woodsmen and to take them over the proposed extension. On the 25th of June last, I started from Boston in the morning, met my men by appointment at the Twin Mountain House, and camped on the North Twin that night.

The next morning we were early on the summit of the South Twin, — the end of the path, — and vigorously began to push our way through the scrub spruces over the remainder of the ridge. So many are now familiar with this growth, that it is not necessary to recount the difficulties. I will only say that three strong men were many times that day almost ready to succumb, and that we slowly dragged into camp on Bear Brook at ten o'clock that night. The difficulty of carrying provisions and water so far from a base of supplies was so formidable, and the work itself was so disheartening, that friendship alone enabled me to induce the men to undertake the task.

The path was completed in season for the Field Meeting in July, and thus enabled the committee to carry out the plan of taking a large camping party over the whole range and through the forest region of the East Branch of the Penigewasset. The path descends from the South Summit to the col beyond, thence bears to the left of the ridge to avoid two

scrubby elevations, and thence directly to the bare summits of Guyot. From the col beyond Guyot it ascends the somewhat steep summit of Bond.

The route over the bare summits is marked by cairns, and signs have been put up, at doubtful points, from the Twin Mountain House to the Cliffs. No attempt has been made to mark a route from the summit of Bond to the Cliffs; but the direction is indicated, and there is little difficulty in finding a way over the rocks.

From the Cliffs a path has been cut through the surrounding belt of spruces, and spotted and cleared through the timber to the bed of Bear Brook.

We think a sign should be placed at the junction of Bear Brook with the East Branch, so that one unfamiliar with the region, desiring to approach Bond from that direction, may be certain of ascending the right stream; and we hope some one may undertake the measurement of our path another year.

NEW PATHS IN THE VICINITY OF RANDOLPH. BY E. B. COOK.

1. From the Howker Cottage, situated a third of a mile from the Ravine House, on the road to Jefferson, starts a wood-road which passes the lower and upper mills on Cold Brook, and separates into two branches near the "Ladies' Bridge." One of these branches crosses the said bridge, which spans Spur Brook, and taps Lowe's Ravine Path well to the eastward, being intended as a direct route to King's Ravine. The other branch keeps on the west side of Spur Brook, and strikes the Ravine Path farther to the west. The purpose of this branch was to connect with a path designed by Mr. W. H. Peek, of Chicago, which was to lead up to Lowe's Camp on Mt. Adams. By this cut-off, the distance from the camp to the Ravine is lessened, the distance from the Ravine House is very much shortened, and the route opens an easy communication with points beyond Lowe's Camp. The cut-off was both engineered and blazed by Mr. Peek, and was afterwards well cut out by himself and two friends belonging to the Club. The wood-roads were neatly cleared by Mr. Laban M. Watson, assisted by two of his men.

2. A blazed line, engineered conjointly by Mr. Lowe and the writer, and blazed by Mr. Lowe, leads from Randolph Hill to the head of the Ice Gulch. This line can be readily continued to Crescent Mountain, and a branch can be made leading to the top of Randolph Mountain.

3. A path was cut from the top of Carter Dome to the north peak thereof, by Mr. Lowe, assisted by the narrator. The north peak is a remarkably fine view-point, the outlook being entirely unobstructed.

4. A blazed line was carefully engineered by the Councillor of Exploration from "Lookout Cliff," and the eastern face of the west peak of Randolph Mountain, to Safety Pond, over which there is such an attractive

view of Mts. Madison, Adams, and Jefferson. This blazed trail was subsequently cut out, and made an excellent path, by Mr. Watson, assisted by three of his men.

5. Last year a promising route was thought of by the writer, whereby the Castellated Ridge of Mt. Jefferson might be readily reached from the west side ; and this conception has been carried into effect. About a mile west of Mr. Lowe's, on the road to Jefferson, is the "Bowman Place," and from there starts in a wood-road which is over a mile in length, and ends near the eastern bank of Israel's River. From this point a line has been blazed to where the streams of the Ravine of the Castles and the Ravine of the Cascades meet to form Israel's River. From this fork a path has been cut which leads along the stream of the Ravine of the Castles to a point below the col which joins Mt. Bowman and the Castellated Ridge. Several handsome waterfalls are passed a little above the fork. From the point below the col just mentioned, the path leads upward to the col, and by it connects with the Castellated Ridge, which ridge is also traversed by the path. The attractiveness of the projected route served to collect a goodly corps of volunteers to assist each other in the good work, to wit : Mr. Watson and an assistant, Mr. Hubbard Hunt (the well-known guide), Mr. W. H. Peek, of Chicago, Mr. G. A. Sargent and Mr. A. Matthews, of Boston, Mr. A. R. Thompson, Jr., of New York, and the chronicler. A good day's work upon the path was performed upon the 8th of September. Several days afterward, Mr. Hubbard Hunt and the writer spent another day upon the work, making improvements, and completing the path to the junction of the Ravines.

Excursions of the Season of 1883.

THE largest party which ever made an excursion under the auspices of the Club—two hundred and ten members and friends—visited MIDDLESEX FELS, May 19. After some delay, caused by the unexpectedly large number, the train left the Boston and Lowell Station at 12.15 for Stoneham. The walk was from Stoneham to Bear Hill and Taylor Mountain, thence to Pine Hill, and thence to Medford, a distance of five and one-half miles. A majority of the company walked the whole distance; but four barges were provided for those who wished to ride while upon the highway. From Bear Hill a good view was obtained of Stoneham, Wakefield, the Danvers Asylum, and the ocean; the haze, however, made it difficult to distinguish Monadnock and other distant elevations. From Taylor Mountain an extensive view to the south was obtained, embracing Arlington Heights, the Milton Hills, Boston Harbor, and the ocean; while directly below, on the right, was the Winchester Reservoir, and on the left Spot Pond. Those who ascended Pine Hill had a good view of

the Mystic Valley. The weather was very fine for a walk, the heat of the sun being tempered by a cool breeze. The party left Medford at 5.50 by the Boston and Maine Railroad, and reached the city at 6.15.

ON Saturday, June 23, a party of about fifty left Boston, at 9 A.M., for GREENFIELD, N. H., — a special car being furnished for the whole trip, and a special engine between Nashua and Greenfield. At Wilton the party was entertained by D. Whiting and Sons, who not only conducted their guests through their celebrated cheese factory, but invited them to a bountiful collation of crackers, cheese, and milk. The train arrived at Greenfield at about 12.30, and an excellent dinner was served in the dance-hall of the Mayfield House. Many of the party walked to the top of the hill, a short distance from the hotel, where a good view of the surrounding mountains was obtained. The train left Greenfield at 2.30, stopped at the base of Lyndeborough Mountain to leave nine of the company, and then carried the others on to a place where there was an abundance of mountain laurel.

Of the nine who climbed Lyndeborough Mountain, six were contented with the lower peak; the three others ascended to the highest point. The start from the base was made at 2.45, the lower peak reached at 3.25, and the highest point at 3.40. In the north could be seen the Sandwich Range, from Chocorua to Black Mountain. Mt. Washington and the Franconia Range were invisible, on account of the haze. The views of Crotchet and Monadnock were particularly interesting. The descent to the railroad occupied about twenty-five minutes. The train stopped here and there to take up its passengers; and soon the car was gayly decorated with bunches of laurel gathered for friends at home. The party arrived at Boston at about 7 P.M.

FRIDAY afternoon, June 29, a party of fifty-five left Boston on an excursion to the HUDSON RIVER and the CATSKILLS. A special car conveyed them to Fall River, where passage was taken upon the steamer "Bristol." At New York they were again transferred to the elegant steamer "Albany." The sail up the Hudson was delightful; and the passage through the Highlands was especially interesting on account of the black thunder-clouds which rolled over Storm King. At Rondout cars were taken on the Ulster and Delaware, Stony Clove, and Kaaterskill Railroads. The fine views in the Clove rendered this ride one of the most attractive features of the excursion. On arriving at the terminus of the railroad, the party was received by the proprietor of the Hotel Kaaterskill, Mr. George Harding, a member of the Club, who did all in his power to make the excursion successful. The Hotel Kaaterskill was thoroughly appreciated by all.

Sunday morning, a large number of the party ascended the north tower of the hotel, and Mr. Harding pointed out the different mountains which were visible, and gave considerable information concerning drives, walks,

and climbs. The day was exceedingly clear, such a day as is seldom seen during the summer months. In the foreground was the beautiful valley, divided by the river, and checkered by patches of grain and clumps of trees, while in the distance were the Berkshire Hills and the Green Mountains, clearly outlined against the sky. In the opposite direction a fine view of the Catskills was obtained.

Monday morning, the whole party visited Haines's Falls, and from there a majority went to the Kaaterskill Falls and the Catskill Mountain House. A company of sixteen, five ladies and eleven gentlemen, ascended High Peak, 3,664 feet high, leaving Haines's Falls at 10.15, and arriving at the north lookout at 12.40. From this point a fine view was obtained of the Kaaterskill Clove, the Kaaterskill Mountain, with the hotel on its summit, of North Mountain, and of the range of which Black Dome is the culmination. The climb from the north lookout to the summit took ten minutes. A good view from the top could be obtained only by climbing a tree. Besides the mountains just mentioned, the Overlook could be seen in the south and Hunter in the west. The Berkshires were invisible on account of the haze. The descent was made in about one and one-half hours.

On Tuesday two parties, of five each, drove to the Overlook Mountain House, a party of six drove through the Clove, and several parties walked to the Kaaterskill Falls, the Catskill Mountain House, and Sleepy Hollow. No ascents were undertaken on account of the haze.

On Wednesday morning, at 8.30, a majority left for Boston, *via* Hudson and the Boston and Albany Railroad.

In connection with a Field-Meeting held at the Twin Mountain House, a party of about thirty-five climbed CHERRY MOUNTAIN on Saturday afternoon, July 21. Eight men had been at work during the day clearing a lookout in the direction of the Twin Mountain Range. This lookout presented a fine view of the Notch, with Chocorua in the distance, a good view of Garfield and Lafayette, and a particularly interesting view of the Twins.

From the other lookout a fine view of the Presidential Range was obtained. The air was clear and cool. From the summit of Cherry a party of sixteen proceeded to Owl's Head, where a fine view to the north was enjoyed.

The principal excursion in connection with the above-mentioned Field-Meeting was a trip over the TWIN MOUNTAIN RANGE, to the valley of the East Branch of the Pemigewasset, and thence over Mt. Field to the Crawford House. Monday night, July 23, there was a party of forty-two, including six packmen, in the Club camp on the side of the North Twin; only twenty-two, however, continued to the end of the trip.

On Tuesday the party ascended the North Twin, and thence proceeded over the entire range, South Twin, Guyot, and Bond, to the Cliffs beyond Bond. The weather during the day was remarkably favorable, the air being cool and very clear. Innumerable mountains were visible, and

many interesting views were enjoyed; but the finest view was that of the East Branch wilderness as seen from Bond and the Cliffs beyond Bond. Tuesday night was spent in camp on Bear Brook; Wednesday night, on the East Branch, about two miles above the Forks; and Thursday and Friday nights, a few rods above Willey Brook. The chief attractions of the long tramp through the wilderness were the grand old trees of the primeval forest, occasional views of the surrounding mountains, Thoreau Falls, and the New Cascades, trout-fishing, and, last, but not least, the exhilarating life in the open air. The weather continued fine until Saturday, the day on which the party went over Mt. Field and returned to the Twin Mountain House.

During the ten days which the Club party spent at the Twin Mountain House, forty-two ascended Mt. Washington, fifty visited the Profile House and the Flume, — both of these excursions having been arranged by the Excursion Committee, — and about fifty ascended Mt. Willard. The Field Meeting was attended by about one hundred persons, two-thirds of whom were members, and the others invited friends.

THE excursions made in connection with the Field-Meeting at NORTH CONWAY were the following: —

On Tuesday afternoon, September 4, a party from Intervale ascended HURRICANE, and one from North Conway ascended MIDDLE MOUNTAIN. Both parties were favored with fine views.

On Wednesday a large number took the railroad excursion through the Notch, some ascending Mt. Willard and others Mt. Washington. Twenty-seven — ten ladies and seventeen gentlemen — left the train at Bemis at 8.30 A.M., and ascended MT. CRAWFORD by the old Davis Path. A majority of the party reached the summit at 11 A.M. The clouds, which overcast the sky during the morning, were soon dissipated by the warm sun and the cold northwest wind, and at 12.30 even Mt. Washington was free. The view was fine; the air was clear, and many distant points were visible. After three hours spent upon the summit, the party descended to Bemis, some by the path, and the others by a slide and the pathless woods. Two gentlemen left the party on Mt. Crawford, and ascended the Giant's Stairs.

On Thursday, at 7.15 A.M., a party of twenty-eight — nine ladies and nineteen gentlemen — left North Conway in barges for CHOCORUA. The ascent, by the Hammond Path, was commenced at 10 A.M.: the first — a young lady — reached the summit at 12.30; the majority of the party, at 2 P.M. The weather was delightful, and the view both grand and charming. Two of the party descended *via* the northern peaks, and reached the road at Piper's; the others left the summit at 3.10, and reached Hammond's at 6 P.M. North Conway was reached at 9 P.M.

On Saturday, October 6, about seventy-five members and friends visited the gorge called PURGATORY, situated in Sutton, in the southern part of

Worcester County, Mass. The party left Boston at 9 A.M., in two special cars, on the New York and New England Railroad, and at East Douglas barges were in waiting to convey the party to the gorge. A stop was made by invitation at the manufactory of the Douglas Axe Company, where the party was courteously received, and conducted through the interesting works. The road to Purgatory led by the side of several beautiful lakes, the water of which affords power to the industries of Whitinsville. After a ride of five miles and a walk of one-half mile, the head of the gorge was reached, shortly before one o'clock. There the party lunched, and, through the kindness of the members of Mrs. Whittin's family, excellent coffee and an abundance of fruit was provided for all. About an hour was spent in exploring the interesting ravine and in gathering ferns, autumn leaves, and geological specimens. Professor W. O. Crosby was invited to make a few remarks; and he gave it as his opinion that the ravine was caused by volcanic action, and not by the action of the sea. On the return, cars were taken at Whitinsville Station on the Providence and Worcester Railroad, a change made to the New York and New England, and Boston reached about 6.30 P.M.

ON Saturday, November 10, about fifty-five members and friends visited BLUE HILL, in Milton.

Members added since April 9, 1883.

HONORARY MEMBER.

John G. Whittier, Amesbury, Mass.

CORRESPONDING MEMBERS.

Arabía y Solanas, Ramon, Barcelona, Spain.

Budden, R. H., Florence, Italy.

CORPORATE MEMBERS.

Abbott, Nathan D., Watertown.

Adams, Mrs. M. E., Boston.

Alden, John E., Boston.

Barstow, Miss S. M., Brooklyn,
N. Y.

Blackwell, Miss Alice Stone, Dor-
chester.

Bolles, Wm. P., Dorchester.

Briggs, Fred. H., Boston.

Briggs, Mrs. Oliver L., Boston.

Bryant, Oliver F., Woburn.

Burrell, Herbert L., Boston.

Butler, Alford A., Bay City, Mich.

Butler, Philip A., Boston.

Carruth, Miss Ellen, Dorchester.

Chadwick, O. B., Peabody.

- Chickering, Geo. H., Boston.
 Chickering, Mrs. Geo. H., Boston.
 Choate, Mrs. Charles, Woburn.
 Codman, John T., Boston.
 Codwise, George A. P., Wellesley Hills.
 Cumming, Alfred J., Somerville.
 Currier, Mrs. S. E. D., Roxbury.
 Cushman, Miss A. A., Boston.
 Cushman, Miss Sara E., West Newton.
 Cutler, Mrs. A. F., Chelsea.
 Cutler, Miss Harriet S., Brookline.
 Daniell, Miss Maria E., Boston.
 Davis, George O., Lexington.
 Dennison, George A., Springfield.
 Dimick, Orlando W., Watertown.
 Dodge, Charles F., Boston.
 Dodge, Miss Emma F., Dorchester.
 Dodge, H. C., Boston.
 Ellis, Sumner, Chicago, Ill.
 Elting, Irving, Poughkeepsie, N. Y.
 Farwell, Miss Mary C., Boston.
 Fisher, Miss Eliza C., Roxbury.
 Goodwin, Henry, Charlestown.
 Gordon, Mrs. Geo. A., Framingham.
 Greenough, H. M., Boston.
 Hadley, Amos, Concord, N. H.
 Hart, Mrs. N. O., Roxbury.
 Hildreth, H. A., Boston.
 Homans, Miss Sarah E., Milton.
 Homer, Miss E., Roxbury.
 Hubbard, S. F., Boston.
 Hutchins, Charles L., Medford.
 Johnson, Miss Emily, Melrose Highlands.
 Kennedy, Miss Susan C., Boston.
 Knapp, Arthur M., Watertown.
 Langley, Miss Ada L., Boston.
 Lincoln, Miss Agnes W., Medford.
 Lincoln, Miss Mary E., Hingham.
 Lindsey, N. Allen, Marblehead.
 Littlefield, Miss Amy, Mattapan.
 Matthews, Albert, Boston.
 Métivier, James, Waltham.
 Métivier, Mrs. James, Waltham.
 Morgan, Mrs. William F., Lynn.
 Morville, Rob't W., Jr., Fall River.
 Newhall, Mrs. E. J., Boston.
 Noyes, Chas. L., Somerville.
 Patten, Francis B., Roxbury.
 Pingree, F. J., Boston.
 Pitman, Robert C., Newton.
 Pope, Frank L., Elizabeth, N. J.
 Prang, Louis, Roxbury.
 Richardson, R. J., Boston.
 Roberts, Miss Fannie E., Boston.
 Robinson, Mrs. Sarah J., Chelsea.
 Sawyer, Edwin F., Cambridgeport.
 Scudder, Gardiner H., Cambridge.
 Seaverns, Miss Mary R., Jamaica Plain.
 Small, Sylvanus C., Winchester.
 Smith, Chas. Lothrop, Boston.
 Spaulding, Mrs. Lucy W., Newton.
 Stearns, Thomas J., Roxbury.
 Stone, Lincoln R., Newton.
 Stone, Miss Lydia R., Medford.
 Tainter, Newell B., Watertown.
 Thorpe, Elliott G., Boston.
 Ticknor, H. M., Jamaica Plain.
 Tuxbury, Miss Nellie, Charlestown.
 Wales, Miss Ella S., Dorchester.
 Warren, Herbert L., Roxbury.
 Warren, Miss Louisa S., Boston.

Watson, Laban M., Randolph, N. H.
Wheeler, Charles, Boston.
White, T. E. M., North Conway,
N. H.
White, Mrs. T. E. M., North Con-
way, N. H.

Whitman, Mrs. Sarah W., Boston.
Wiswell, Charles H., Cambridge.
Witherle, George H., Castine, Me.
Wood, Rufus K., South Boston.
WRIGHT,¹ ELIZUR, Medford.
Wright, Horace W., Abington.

¹ Life-Member.



Camp Thunder, a deserted logging-camp on the Mount Adams Path.



Photographed by Gardiner Hubbard Scudder, Jan. 1884.

Phototype, F. Gutekunst, Philadelphia.

Bed of Cold Stream, at the entrance to the forest, on the logging-road to Camp Thunder.

WINTER SCENES ON THE SIDE OF MOUNT ADAMS.



Camp Thunder, a distance of several miles on the Mount Adams Path.



Photomontage by the author, published in the *Geologist*, Dec. 1901.

Phototype, F. Oakeson, Philadelphia.

View of snow-covered forest, at the entrance to the forest, on the logging road to Camp Thunder.

WINTER SCENES ON THE SIDE OF MOUNT ADAMS.

APPALACHIA.

VOL. III.

BOSTON, APRIL, 1884.

No. 4.

A Reconnoissance on the Carter Range.

BY MISS EDITH W. COOK.

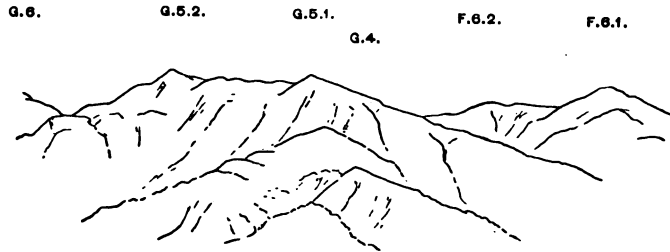
Read November 14, 1883.

THE wish was jocosely expressed, in behalf of the members of the little party contemplating the exploration of the Carter Range, that enough of them, or of their raiment, might survive the trip to provide substance for a decent funeral; so evil has been the reputation of these mountains among their fellows, their especial depravity consisting in supposed illimitable and impenetrable forests of scrub-fir, offering only a wearisome struggle to the pedestrian, and no adequate reward to the topographer and lover of mountain outlooks.

Undeterred, rather incited, by these reports of the unworthiness of the Range as a field for exploration, an ardent mountaineer had resolved to have it erased, at an early date, from the list of the unvisited regions; and he had little difficulty in arousing in the soul of a well-known guide of Randolph a similar desire. Was not Carter Mountain waiting, as it were, for some hardy champion to carry its colors at the lance point into the field where it still remained unrecognized, with none to give battle for its loveliness? Carter Dome had indeed been crowned a queen of beauty; but its dark-browed sister, being credited only with scowls for them that sought her, still remained unhonored save by fear, neglect, and scorn.

300 A RECONNOISSANCE ON THE CARTER RANGE.

By the Carter Range, as written of here, is meant that line of mountain extending from the division between Mt. Moriah and Imp Mountain to the Carter Notch. In Carter Mountain is included only that portion lying between Imp and the deep depression separating Carter Mountain from Carter Dome. As seen from Mt. Moriah, Carter Mountain shows two principal peaks, one at each end of the line of greatest elevation.



CARTER MOUNTAIN, FROM MT. MORIAH.

Less marked eminences lie between these two peaks, which are here spoken of, respectively, as Carter North (G. 5. 1) and Carter Middle (G. 5. 2), while beyond this latter, which is the highest point of Carter Mountain, lies still another peak, — Carter South (G. 5. 3), not visible from Moriah and higher than Carter North, — which forms the north side of the gap between Carter Mountain and Carter Dome, the steep south side of this dip being formed by the north peak (G. 6. 2) of the Dome. Accompanying outlines may possibly serve to make more clear the topography of the region traversed.

On the morning of Aug. 27, 1883, this Carter exploring party left the Ravine House, Randolph, at 7.39 A. M., driving to a point on the Hitchcock Farm, in Gorham, from which the path starts for the ascent of Mt. Moriah, from the summit of which was to begin the pathless walk over the Range. The party consisted of Mr. E. B. Cook, the projector of the expedition, Mr. Charles E. Lowe, its guide, — whose son, Thaddeus, accompanied as packman, — Miss S. M. Barstow, of Brooklyn, Mr. George A. Sargent, of Boston, and the present writer. A stop was made in the village of Gorham for aneroid observations and for various purchases, — notably, a tin

pail, since become a historian. After leaving the wagon at the pathway bars, some time was required for the proper arrangement of packs, the ladies being relieved of a portion of their *impedimenta* by our guide and his son, who were well burdened with their own blankets and the stores required for a two days' tramp; while the amateur woodsmen shouldered their own wraps and allowance of bread and cookies. At ten minutes past nine our little party left the road for the ascent of Moriah, and at 12.22 reached the top, on the way passing round the forest fire that was running in the dry moss and the spruce timber on the shoulder above Surprise, and that threatened to destroy some of the beauty of one of the most beautiful of mountain paths,—a fire that on the 24th of September was still sending up its slight columns of smoke from the forest.

The day was a brilliantly clear one, and the atmosphere most admirable for thorough topographical inspection in every direction; but the wind blew so savagely that, with the mercury at 50°, it was difficult to combine well topographical enthusiasm and a passable degree of comfort. In the summit cairn our chief deposited an Appalachian record-

G.4.

G.5.1.

M.1.

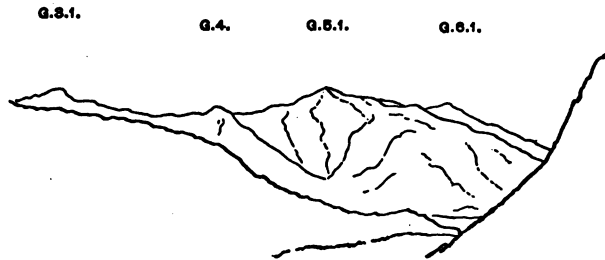


CARTER MOUNTAIN, FROM THE BERLIN ROAD.

bottle, the first the mountain has received, notwithstanding its veteran fame as a view-point and its use for geodetic purposes. From the summit our captain and our guide surveyed the line of the Carter Range, and the plan was laid out for its traversing, more especially for the descent of Moriah and the ascent of Imp (G.4); the intention for the first day's walk being to get as far beyond Imp, to the south, as time would allow and a fitting place could be found, near water, for the

302 A RECONNOISSANCE ON THE CARTER RANGE.

night's camp. Into the little ravine that lies just below, and to the northeast of, the crest, we descended, a shivering party, to dine by the cool head-waters of a stream, whence, after dining, we reascended to the summit, where the aneroid observations were made and we girded on our burdens anew for the pathless descent, which was begun at 1.45 P. M.



CARTER RANGE WITH MT. MORIAH (G. 3. 1.), FROM
JASPER CAVE, BERLIN.

Entering the fir forest, we descended rapidly the abrupt incline toward Imp, the way being an open one, impeded only by the fallen timber,—the long-dead trees that singly or in companies lay among the ferns, the rocks, the moss, and some slight undergrowth. Masses of solid and broken rock were also encountered, affording to some of us, who held the rear of the Indian file, much entertainment as some comrade would disappear perpendicularly down the side of a rock into a pit, presumably expecting to reach bottom somewhere, but leaving in the mind of the follower a sense of the inadequacy of feminine stature as measured with even a portion of the mountain, although it be held axiomatic that “no mountain can measure with a perfect man.”

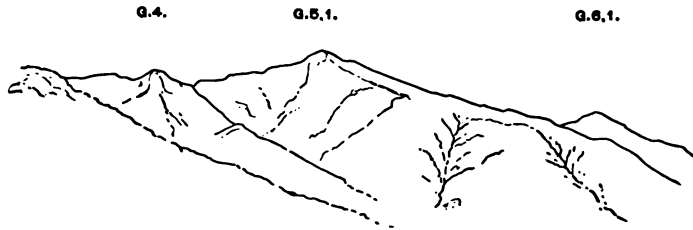
Between the summit of Moriah and that point where Moriah ends and Imp begins, two fair-sized streams were crossed, as well as several rivulet beds only waiting wet weather. At 2.52 this dividing point was reached. Here a small grass-bordered pond furnishes the head-waters of a stream seeking the Wild River, and marks were seen of a hunter's trail leading up from the Peabody valley and across the divide to the valley to the eastward. From here we began the ascent of Imp Mountain; another stream, one of the tributaries of Imp

Brook, — the cooling waters of which were found most refreshing, — being crossed before climbing the steep cone (as seen from Gorham) of the summit, which we approached from the east, the west face not being feasible as a pathway on account of its huge perpendicular cliffs. This eastern ascent of Imp was found steep, but not too difficult, the sturdy firs on the tops of the mossy rocks affording a firm support for the grasp of the hand, thus enabling the rest of the body to do its share in working its way up the face of the rocks and landing in safety on the top in spite of an occasional rebuff on the part of the scrub, as ready to deter as to assist. At 3.55 the summit of Imp was attained, and the packs were deposited among the firs, — here too tall to look over, — while a portion of the party descended to the cliffs of the west face, a little distance below, returning more impressed by the size and deep descent of the cliffs than with the mountain view to be obtained therefrom, — a view presumably most interesting from the commanding situation above the Peabody valley. On the return to the summit the aneroid observations were taken, and it had then become time to think more nearly of finding a spot for the night's camping. Descending in a southeasterly direction from the summit, a walk of fifteen minutes brought us to a green level place among great moss-covered rocks, where the nature of the ground gave promise of water; and indeed a little pool was shortly found, and larger pools showed themselves as the hidden course of the stream was followed down a few steps, — the head-waters of some eastward-bearing brook, — and one wide pool near a rock finally gave assurance of more than fulfilling all the needs of a camp. Near by were sheltered places for the camp-building, while the tall fir and spruce trees of the forest were close at hand to furnish fire-wood and building materials. Here ended, at 4.25, the first day's tramp; straps were gladly unbuckled, packs thrown aside, and our energies were devoted to the duties of the new situation. While the heavier work of camp-building was going on, the needle was made useful in repairing the slight damages of the day, — in part a forearming against those ravaging forests that still eluded us, and that must be met with on the following day.

The site for the camp was at once happily found and admirably chosen ; that our guide pronounced it fitting, was in itself a guarantee of excellence. A huge rock, the top of which supported a park of moss and small scattered fir-trees, made a tall chimney-back for the fire, as well as a shelter against the wind, while it served as a resting-place for one of the long poles on which lay the roof-trees of the bough-house, into which drifted at no time either smoke or sparks, so excellent was our chimney's draught. The deep blankets of moss — their ordinary pattern varied now and then by the trailing dark-green of the snow-berry — were rent from the neighboring rocks and stuffed into the crevices of the roof-covering of balsam boughs ; while feminine skill was called into requisition to make smooth and soft and deep the floor of the camp, laying the feathery moss thickly under the spicy-sweet fir-boughs, and seeking carefully to make the stems as little prominent as possible. The camp built, the blazing fire was a most welcome friend, with the mercury marking 49° in the sunless woods ; and then supper became the most important thought in the minds of the hungry trappers. Our thoughtful guide handed over again to feminine fingers the picking of the raisins, furnished from his private stores for the bettering of our hasty-pudding, which, eaten with butter and maple-sugar, was pronounced all that could be desired. Some of us indulged in a cup of chocolate, made rich with condensed milk ; and after all was set in order for the night, the last jest dispensed, and the consoling pipe of the guide had given its sweet satisfaction, the camp became quiet at a comparatively early hour, and the struggle for sleep began : blanketed figures, like mummies in appearance, lay stretched out on the green boughs, while wide-open eyes, waiting for sleep to come, watched the fire and the stars, and thoughtful hearts moralized by the crackling logs in the silent forest, 3,490 feet above the sea.

In view of the length and supposed difficulties of the way remaining for the following day, it had been intended to make a very early start ; but the sweet sleep of the morning hours frustrated the well-laid plan. It was with a mingled feeling of wonder and gratitude that the writer greeted the

broad daylight that filled the woods when she awakened; and it was not until a quarter of seven that, breakfast over and the packs adjusted for the day's tramp, we were *en route* for the traversing of the Range. At the beginning of this second day the writer was relieved of all her *impedimenta* by our guide, while Miss Barstow still bravely bore a portion of hers over the hills and through the brush. Whoever has carried a pack, be it ever so slight, knows what a new strength and elasticity seem to be added to the footstep when the burden is no longer borne, — like Christian at the wicket-gate. Not the least pleasant subject of the writer's meditations before the camp-fire had been the thoughtful and manly care of our guide for those under his charge.



CARTER RANGE, FROM MT. HAYES.

Climbing the col between Imp (G. 4) and Carter North (G. 5. 1), we coasted along the western slope below the summit of the ridge, descending, and again ascending toward the abrupt side of this latter peak, the ascent of which was found in character like that of Imp, perpendicular ledges presenting themselves, but these readily flanked by the skill of our guide, who seemed, as we wound with little difficulty up the easterly side, as if led by some clew-bearing Ariadne through the rock mazes of the mountain labyrinth. It is true that at times the writer would eye doubtfully some long step made by those who preceded her, and from whose retiring feet she would sometimes have to draw back; but nothing offered itself that could not readily be done, and a helping hand was never lacking where pride condescended to make use of such assistance. No rest was taken until just a little below the top of this first peak, where, above a steep ascent, was chosen as a breathing

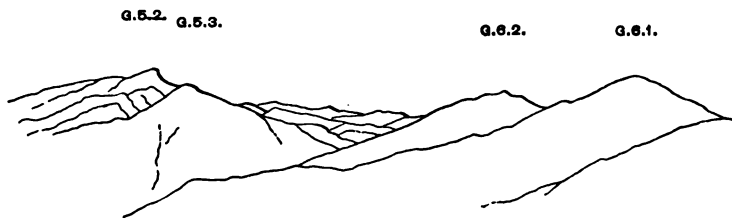
place a mossy garden, and an especially soft place pointed out to one of the ladies by our guide, as only waiting to give her ease. A few moments' rest and some minutes of ascent, and we reached the open rocks that lie on the eastern slope of Carter North (G. 5. 1),—rocks overgrown with gray moss and blueberry bushes and Labrador-tea; the fir-crowned top of the mountain rising beyond and above. From this point we looked down into the Wild River valley; over it, to Royce and Baldface mountains, and the eastward-lying horizon; to the north rose Moriah, and we looked back on a portion of the great cliffs on Imp, the gray masses of rock picturesquely jutting out from the dark green slopes. Looking also along the line of Carter Mountain, note was taken of its form, the various eminences lying between Carter North and Middle (G. 5. 1-2).¹ It was here determined to omit from our course between these two peaks a certain height to the east, and traverse the Range by the more western course, so taking in more of the profile line. Shortly after leaving the viewpoint, the supposed summit of Carter North was reached,—an open fir forest with pleasant mossy carpet, where a halt was made for aneroid observations, a rest, and a more advantageous arrangement of packs. Here, on the mountain top, at 8.35, the mercury stood at 48°. The day, like its immediate predecessor, though less sunny, since the sky thickened at times with clouds presaging an easterly storm, was an invigorating one for exercise; and a seasonable arrival on Carter Dome seemed now almost assured. It was at this point that the kettle bought in Gorham the day before became our historian; and, alas! like its guild, I fear it committed itself to a misstatement in recording itself set up on "Carter 3;" for we discovered, after leaving it firmly fastened to a fir-tree our guide had prepared for the purpose,—the still shining tin inscribed with the names of our party and the day's date,—that, a few steps farther on, there was a slightly higher summit to this north peak, and that, as we continued along the ridge, Carters seemed to multiply themselves indefinitely. But the historian remains where it was first set, with its original record, to which another has been since added by

¹ See cut on page 300.

one of our little party of that day,—Miss Barstow,—who, more than a month later, exploring the Imp Face that is on one of the lower buttresses of Carter Mountain, with Mr. L. M. Watson, of Randolph, ascended Carter Mountain from the Face, and found the historian still at its post, and the green, mossy carpet white with several inches of snow. The kettle, before it assumed its loftier mission, had become a rather inconvenient appendage to Thaddeus's pack, catching on brush and scrub; and we had resolved to abandon it on the mountain, when our guide suggested that it should be posted to serve as our mark on the summit, a sign for future explorers of the already fallen footsteps of the white man.

Some of our provisions were also abandoned at this point, that no useless weight might be carried; some hungry members of the party helping to lessen the stores by a light lunch. Leaving the second and higher crest at 8.55, we followed the trend of the range to the west, the way leading at times along the top of the ridge, at times below it, as the character of the walking suggested; now leading through the low, open fir woods with firm mossy footing,—woods prevailing so largely on the Carter Range,—now through belts of tall scrub; now crossing low, open, mossy places promising water, or emerging on bare rocky spots whence partial views could be obtained, now of the region left behind, now of that still to be traversed, and now of the line of the Great Range extending its parallel on the other side of the Peabody Glen. From one of these points, in swiftly passing, was obtained a view of the Imp Face seen in profile, and presenting exactly the same countenance as that seen from the Copps Farm on the Pinkham road to Randolph. Certain eminences to be attained would be seen, apparently some distance off, and then a few moments' following of the leader's clew through the hiding forests would bring us to the desired outlook; the huge mass of Carter Dome, the end of our desire, seeming, all the while, to grow scarcely any nearer, and the deep gap between it and Carter Mountain growing deeper, as if making the Dome a whole new mountain to climb when the hours should be most wanted and enough labor already crowded into the time

passed. It was pleasant during the day, as from time to time some tougher bit of climbing or scrub was surmounted or transpierced, to hear the cheery voice of our guide, at the head of the well-kept line, asking if there were "any ladies in this party," and to be able to reply quickly, and not as a far, faint sound coming from some deeps below, "We are here;" for closely each followed each, needing to beware of rebounding fir-twigs or a possible step backward.



CARTER MOUNTAIN AND CARTER DOME, FROM WILDCAT (M.1.1).

At 9.55 we reached the summit of Carter Middle (G.5.2), the highest point of Carter Mountain, which we found wooded and without outlook. It having been observed that the line of the ridge lying between this peak and Carter South (G.5.3) swung round far to the west, it was decided to go rather to the east, following under the cone and the cliffs, so as to shorten the distance into the deep depression and save time and strength. At 10.15 the top was left, and the way along the east side was found easy and pleasant, leading over level gardens of the pale green moss that gives token of moisture beneath, — a token, in this case, remaining unredeemed; dried pools, where water had been, presenting themselves now and then, to beguile and disappoint the lips that began to grow a little parched, as no water had been met with since breaking camp in the morning. In a little while the route led out on the cliffs that look down on the great forest-clad gulf that runs up into the side of Carter Mountain and Carter Dome, from the Wild River valley. Standing on the edge of one of these cliffs, we looked down on the tree tops below us, the slope of the mountain making an almost perpendicular descent into the wilderness valley of the stream more than a thousand feet below, and beyond the valley again we saw the

heights of the Wild River mountains and the undulating lands still beyond. Across the gulf, to the south, rose the steep side of the north peak of Carter Dome, the ascent of which from this side offered anything but a promising aspect in point of time. Across this shoulder of the Dome, lying in the shadow of another shoulder, was seen a little, dark, high mountain pond; and as our guide gazed down into the depths of the unscarred wilderness below us, he uttered the wish to search its forests some day for spruce gum. The cliffs were followed doubtingly a few steps farther; but as they became only more precipitous, they were abruptly abandoned, and a new course was taken to the westward, the first steps of the retreat being through some of the toughest scrub-fir met with on the route, clothing the rocks that had to be crossed to secure a firmer going on the ridge. By this time our guide's desire to find water had become so great that on reaching the crest of the ridge leading to Carter South a descent was made, still toward the west, in the hope of finding some of the waters feeding the Peabody River. Mossy parks of a like character with those on the east side were traversed, stalks of hellebore were seen, but still no springs were met with, until at last one shallow pool delayed our steps, where, with gentle care of the dark earth at the bottom, and sufficient time given to successive drinks, water enough could be obtained to satisfy temporarily some of the thirstier ones and gratify the less needy. During this halt for refreshment Mr. Lowe and his son, unsatisfied with the quantity and quality of the water, sought in the forest for deeper fountain depths; but these—or any other—were not to be found. The seeming beginnings of streams showed no immediate purpose of providing water for the rivers of the valleys, and, at last abandoning the search, our steps were turned upward and eastward, through the ferns and the drought-blackened hellebore, as water could be more easily dispensed with than time; and, passing through the open birch and fir forest, we reached the last Carter (G. 5.3) at 11.30. From here began the descent into the deep hollow separating the two great divisions of the Carter Range,—a descent through open woods, and possessing that character of indefinite continuing common

310 A RECONNOISSANCE ON THE CARTER RANGE.

to the downward slopes of mountains, a little ledge at the base offering a pleasant exercise in gymnastics. The bottom of the dip reached, a tiny stream was crossed; but from its waters the fastidious refused to drink, on account of the rich, dark amber color of the draught, which proved, however, clear, cold, and refreshing. A few steps farther, another growing stream was met with; this, followed up a few yards, offered clear white water; and as it was now past noon, it was decided to dine by this acceptable fount, and so begin, thoroughly refreshed, the ascent of the Dome. Advantage was taken of the time spent at the noonday meal to mend a few rips and tears in our walking gear, and then, at 1.15, we left the dining-place to begin the steep ascent leading up from the hollow to Carter Dome North (G. 6. 2).

G. 3. 1. G. 6. 2. G. 6. 1. G. 5. 2. G. 5. 1.



CARTER RANGE WITH MT. MORIAH, FROM BALDCAP MOUNTAIN.

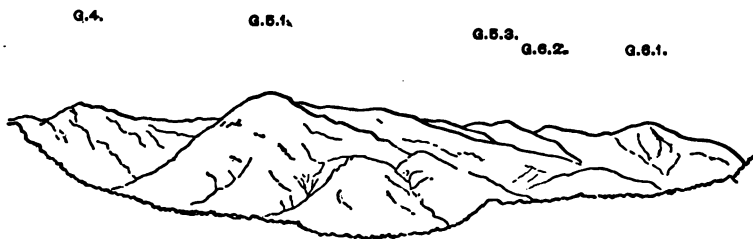
The way was continuously steep; but the footsteps were steady as they trod down the thick growth of *Spinulosum dilatatum* — in its luxuriance, the brake of these open woods of the Carter and Wildcat Ranges, — while the higher understanding debated on the poetical worth of Shelley and Longfellow; a discussion arising from the suggestion made to name Carter Mountain — on account of its length, and because of Mt. Whittier in the Ossipee Range, and to more readily distinguish it from Carter Dome — Mt. Longfellow. Near the top the fern-grown way was exchanged for mossy rocks and a narrow belt of fir easily edged through, — the mountain's final defiance before yielding up the noble citadel of rock that crowns the beautiful summit of Carter Dome North, on which we issued from the scrub, after a thirty-nine minutes' walk from the bottom of the dividing hollow. And here rippled over all the pent-up enthusiasm of the day, — the enthusiasm that had supplied the steam for the walking machinery, and that was now at

liberty to let itself off in fantastic shapes and rose-tinted vapors. Here was the crown-jewel of the dark mountain brow, here the pre-eminent grace of the Range; even the massive Dome having to lower its majesty to the beauty and winsomeness of its lesser, but clearer-sighted companion, seeing without effort those lovely visions of the Great Hills, and the wide-spread lowlands that still lie in a measure hidden from the Dome by its thick green mantle of fir. An open area of rock, and gray moss, and blueberry bushes, and cowberry, forms the summit of the mountain, the low pale-green spruce nestling in the crevices; but nowhere rises any bush or tree to obstruct the view, which is especially remarkable in its commanding of the Great Range from Boott's Spur to Mt. Madison, in the finely moulded form of Carter Mountain sloping up gradually from the Glen side, and then breaking in steep cliffs and falling in precipitous descent to the Wild River,—like a wave caught as it curls and turned to stone. The Dome closes the view to the south for that region lying between Paugus and Carrigain, the sweep to the north and east being the same as that from the Dome, while over Boott's Spur are seen Osceola and Giant's Stairs and Willey. Our hearts were grieved to note the beautiful cone of Chocorua rising above a wreath of smoke, that hung like a necklace on the mountain, and told of forest fires and probable scars.

To leave some permanent sign of the first Appalachian occupation of this most bewitching point of the Carter Range, stones were gathered and a cairn built; each member of the party adding an especial stone as representing his or her share in the monument and the enterprise,—the size of the stone contributed not being always proportioned to the enthusiasm of the contributor. After spending scarcely half an hour in this lovely spot, we again set forth for the end of our labors, though the rarest jewel of our crown seemed secured in the possession of the secret of G. 6. 2. Leaving the rocky cone, the short, stout scrub was wrestled with for a little distance, the massive slope of the Dome sweeping up before us; but an easterly direction was soon taken, where the way was less thick-set, and our well-kept line drew near to the tall fir-thickets that surround the crest of the Dome,—this

human line growing more broken as the eagerness of the leaders increased, and the followers grew more reckless as to the manner of their going, striving to dash through heavier obstacles or tripping on less-looked-for fallen trees,—till, after fifty-one minutes' walk from Carter Dome North, at 2.55 we reached the cairn on the summit of the Dome, advancing upon it by the cleared avenue leading up from the east. Here we were greeted by the friends who had come over that day from the Ravine House to meet and welcome the returning explorers, and by whom our voices were heard in the thicket as we neared, an hour before we were looked for. And here, with a modest sense of our importance as an exploring party, our guide endeavored, with his heliotrope, to win some recognition of our presence from Mt. Washington; but that bustling world would pay no attention to the flashing light so kindled in the wilderness.

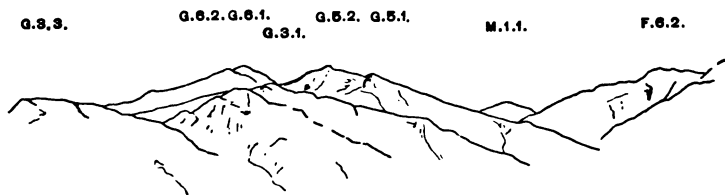
Our work was accomplished, if imperfectly. Each height, save one, of the Carter Range had been traversed; and though, owing to the shortness of the time employed in the reconnoissance, much remained unknown and unnoted, or remains unremembered, the feasibility and interest of the excursion



CARTER RANGE, FROM RANDOLPH HILL.

had been proved, and an immediate result of the investigation was the construction, a few days later, by Mr. Lowe and Mr. Cook, of a blazed path leading from Carter Dome to Carter Dome North. On that occasion a record-bottle was placed in the cairn, to receive, still a few days later, the names of two Appalachians who, visiting the spot from the Ravine House, added their quota of enthusiasm to that already lavished by the exploring party.

On our way over the Range it had been suggested by Mr. Lowe that we should descend the Dome from the summit so as to strike the logging-road leading out to the Glen road by Nineteen-mile Brook ; but, on meeting our friends on the summit, it was decided that we should all descend together by the path and Carter Notch to the Glen House, where our wagon was in waiting for us, and from where, as we drove off, we saw a cold, gray cloud resting on the head of Mt. Washington, while the northern peaks rose, a firm, clear, darkly blue mass, against the golden western sky. At 8 P. M. we arrived at the Ravine House, having visited the undiscovered country — and returned ; the illimitable forests having dwindled, the impenetrable scrub-fir having opened to let us through, like the thorn hedge surrounding the Sleeping Beauty in the Wood, at the approach of the true prince.



CARTER MOUNTAIN AND DOME, WITH MT. MORIAH, FROM MT. INGALLS.

The aneroid observations, taken during the walk, give the heights of the points measured, as follows : —

Mt. Moriah	4,165 feet.
Mt. Imp	3,597 "
Camp on Imp	3,490 "
Carter North (G. 5. 1), lower summit	4,492 "
Carter North (G. 5. 1) near higher summit	4,511 "
Carter Middle (G. 5. 2)	4,561 "
Carter South (G. 5. 3)	4,521 "
Carter Dome North (G. 6. 2)	4,674 "

The mercury in the thermometer varied on the Range, during the two days' walk, from 45° to 57°.

The supposed distance traversed : —

Length of path up Moriah	4 miles.
Distance from Summit of Moriah to camp	2 "
Distance from camp to Carter Dome	7½ "

No rare plants were found, — only some late-blooming *Linnæa borealis* gave pleasure to its finders; no strange beasts were seen, though a bear was reported, more than a week later, as having been seen from Carter Dome, feeding on the berries growing in profusion on Carter Dome North. We saw nothing wilder than a partridge or two, that sought a safer place as our footsteps stirred the ferns or crashed through the brush; we heard no sound more threatening than the ringing of our axe, or the cheerful chirrup of the chickadee with his fearless, near inspection of the featherless biped. When we thirsted, we feasted at times on the large red currants that, as the taste hardens, grow extremely palatable and refreshing. On the various summits of the Range we left axe blazes as a sign to those that should come after us that

Many are the mountain ways,
And old the skies above them,
And long the years when men have lived
To know them and to love them.

A Climb on Mt. Adams in Winter.

BY SAMUEL H. SCUDDER.

AMONG the Appalachians who visited the northern side of the White Mountains last January, were four gentlemen whose main object in seeking this region at this time was to climb Mt. Adams. For this purpose the Ravine House, in Randolph, had been chosen as the head-quarters of the party, — a snug little inn, where every preparation for our comfort had been made by the forewarned proprietor.

We reached the hotel on January 23, at a little after seven o'clock, after a starlight ride from Gorham in a five-seated sledge of rough boards, made for the occasion, and found warm cheer awaiting us. Supper despatched, the evening was spent discussing how and when we should make our ascent, and adjusting snow-shoes. In this, as in everything relating

to a mountain tramp, Mr. Lowe, who had dropped in for the evening, proved an adept. For ordinary use on level ground it is customary to fasten the toe of the foot to the shoe by a simple thong, but for steep ascents and descents more care is necessary; and before we parted for the night all the old boots on the place had been sacrificed to the needs of the occasion. A boot-leg severed from the foot served for a single shoe-pocket; the cut end was securely fastened by thongs to the shoe, and the top slit at both ends to adjust it to the bundled foot thrust into the loose opening. The straps of the boot-leg then served as a *point d'appui* to fasten the foot into the pocket by thongs passed through them, behind the heel and beneath and above the instep.

Although the evening was full of promise, the next morning dashed all our immediate hopes. For two days it snowed. But the time was by no means lost. We practised on our snow-shoes, — altogether an unnecessary procedure, unless to give us confidence against the coming day, — and found a second guide to join Mr. Watson and ourselves, an accident to Mr. Lowe preventing his venturing with us. We visited a blacksmith and procured “creepers,” to use in case of need on the upper mountain, where snow should give place to ice; and so when Saturday the 26th arrived, with its bright sky, we were not only up at an early hour, but all the little vexatious delays of an early party, hurriedly planned, were provided against.

It seemed as if there never had been such a morning. The mountain summits were clear, and the steady wind blew a delicate horizontal cloud of snow from the summit of Adams, adding the charm of defiance to our intentions. The thermometer stood only two degrees above zero of Fahrenheit; but we could laugh at that. Not one of us but had doubled his heavy winter underclothing, and had, besides, a cardigan or leathern jacket, and a cap that would cover the ears. Even against the brisk wind blowing over the open fields to be crossed before the woods were reached we had no need of our ulsters and other heavy wraps, and carried them slung, as superfluous baggage, across our shoulders.

We were off by half-past seven, four gentlemen and two

guides, Watson and Hunt, who carried each a basket on his back, into which went our lunches, hatchets, photographic apparatus, and other paraphernalia, with a rope for possible use on icy slopes. Each of us carried a compass and a spirit flask, — necessary appendages of the cautious pioneer. Our course lay at first over the Moose meadows to the woods, in a direction at a slight angle with the stage road, so as to hit a logging road which strikes the A. M. C. path at the logging camp about a kilometer and a half from its base. The road, as it enters the woods, crosses a little brook, Cold Stream, now completely buried in snow, in the bed of which the photograph was taken which is reproduced on the lower half of Plate VI.

Up to this point walking in the open fields had been over more or less compacted snow, leaving in many places scarcely a trace of our steps. We had only the wind and frosty air to contend with; and as these were only exhilarating we dashed along with perhaps more vigor than discretion. As we entered the forest all was changed; and the rare beauty of the scene, quiet and pure, disturbed by no breath of wind, enticed rather to moderation or even to frequent pauses. The fleecy snow sank at least six and eight inches under our broad latticed shoes; and as we passed along in Indian file we left behind us a trench-like path more than two feet wide, with an almost uniform flat bottom of packed snow. This track may be seen in the photograph of the logging camp on the plate.

Our course was pretty direct, and of an almost uniform, easy grade. We saw neither bird nor quadruped; but the tracks of the latter were abundant. They showed that rabbits, squirrels, and mice abounded; sable and fisher, especially the former, were not uncommon, and now and then a fox could be traced in the various footprints that crossed our path or were freely distributed around a fallen log. One fox had chosen the logging road; and for a long distance our broad, straight track obliterated most of his vacillating steps. We imagined his surprise when he next passed that way! A few birds were heard, but even their tracks were rare; they seemed to be mostly such as feed from the taller trees. Once, higher up, we came across a pair of crossbills, plump, and fearless of

our approach. But everywhere, excepting in the two or three cleared spots we passed,—as at the logging camp,—the snow was covered with the marks of fallen sticks and other fragments, and most of all with those of the fallen clusters of snow-flakes.

Nothing was more beautiful than the fleeciness of the snow. It had not been visited by rain, no sun nor thaw had reached it; but it lay as it fell, compacted only by its own dry weight. Every fallen trunk was crowned by a white wall of more than double its own diameter, as may be faintly seen in the lower picture on the plate. Every stump or other projection of the soil, as appears in the upper picture, became a round-topped cone with gracefully sloping sides. And this was not here and there, but everywhere; the forest was made up of it. But so light and delicate and fluffy was this pure covering of the earth, that when the breeze stirred the tree-tops where the snow had collected in quiet times upon the boughs, and scattered their almost weightless clusters of snow crystals, these flocculent masses sank deep into the snow mantle, dotting it so completely with little pits that nowhere could an unbroken square rod be found. The breeze did not reach the surface of the ground. Every flake that passed the tree-tops remained where it fell; hence these slender walls which crowned the fallen timber, and which a slight jar would dislodge; nowhere the least drifting of the snow excepting where man's interference had opened a passage for the wind, as around the logging camp, where a long ridge fenced off the stable from the camp, as seen in the picture. The charms of the forest in winter are indeed exquisite.

Just before reaching the logging camp, so completely buried in snow, one of the party, wearing lighter snow-shoes than the rest, caught one shoe in a half-buried snag and broke the hoop at the crossbar. This delayed us a few minutes only, the guides quickly repairing it by aid of a young sapling and a bit of wire which one of us had carried for an emergency. These provident people are almost glad of an emergency.

The logging camp was reached at 9.20, and now the regular path and a little steeper climbing were before us. We all took turns at the lead, the foremost man having far the most to do

in breaking the way. When he began to fag, he simply stepped aside, waited for the whole party to pass and took his place at the rear, where keeping up with the rest was but as child's play, walking on the more solid floor of snow. This, however, still yielded to the tread, but only enough to remind one of walking on springing moss. In this way, alternating at the lead, we were able, except in the steepest portions, to keep steadily on with only brief rests. The sign-boards also became a great moral help. We knew just how much we had done,—just how far ahead the camp, the ledge, the summit, lay. We who were accustomed to the path knew where the steep places were, and gloried at each conquest. Yet the path differed from that we had passed over in summer. Then the little inequalities in the surface required a varied play of muscle; now all inequalities were smoothed over, and it was one almost uniform grade, requiring ever an exact and even strain of just the same set of muscles. Then in the steepest places there were roots and stones to give at least the semblance of a foothold, and allow one to halt midway to seek securer footing or a better purchase; now the slight passage of the toe over the crossbar of the snow-shoe did not serve in the slightest degree to check the backward slide over the powdery snow, and here and there a slender twig the hand might seize (and this often treacherous to the touch) was the only aid one could secure. The one way to scale these portions of our way erect was to plant the shoe flat-footed on the snow, and trust to luck that it would not slip back when the other foot essayed a forward step. Many a fall did we have, and many an ignominious backward slide, to the amusement of those behind. Our turn to laugh would come when the hindmost would reach a battle ground, where the scrambling of the leaders had scattered all the looser snow which helped a footing, and where the only method of procedure was a hand and knee scramble till some rigid tree might lend its aid. This lively climbing occurred when we had reached about the third kilometre sign, and its end brought us at a quarter before eleven to the Appalachian camp. It had taken us more than three hours to accomplish what in summer would have taken less than two.

We stopped at the camp, of course. The snow had penetrated every corner, and the rabbits had been sunning themselves under its shelter. With a snow-shoe for shovel we dug three feet to reach the fireplace which has cheered so many a climber, and melting some snow we soon had hot tea to accompany sandwiches and doughnuts. Photographs were taken, axes thrown aside, and provisions buried against our return. Here, exposed to the wind, with the thermometer just at zero, we were still comfortable, so warmly were we clad, and we feasted on the outlook toward Jefferson Hill with a new delight. But after a rest of three-quarters of an hour, one after another grew impatient to be moving, and the actual cold began to test our toughness. One of us was soon discovered to have a frozen nose, and snow was at once applied. It was but the forerunner of similar experiences; for sooner or later each of us was somewhere touched, — cheek, nose, ear, or wrist, — the point of least resistance. And no wonder; we looked like a caravan of Santa Clauses. The moisture of the breath froze not only upon our mustaches and beards, but on our eyelashes, eyebrows, hair, and all our clothing above the chest. Hoary-headed fellows were we, and we bore the crown of glory with pride. Not only had each individual hair become frosted, but a fringe of icicles of frozen breath surrounded our mouths; one, at least half an inch in diameter and an inch and a half long, hung from the upper lip of one of the party, who nourished his rapidly growing mustache with all the fondness of a stripling till it grew too cumbersome for comfort. Another had one eye nearly closed by the freezing together of the lashes.

At noon we started again, and repeated our wild scrambling as soon as we struck the steeper parts of the path; but here, where the trees diminish in size, their aid is more easily obtained, and had we been as fresh as at the start we should have passed more rapidly over the ground. The snow too was less light, and signs of moisture and of wind began to appear. On the lee side of rocks, of trees, and of twigs projecting from the snow, we would find little crannies filled with icicles, — geodes (or pagodes, as one might call them) bristling with the most delicate ice-crystals. Rabbit tracks became

more numerous, in fact were everywhere seen; and on one occasion, as we were on the lookout for the last kilometre mark before leaving the timber, affixed as we knew at only a slight elevation upon a starveling tree, we found it at last, its top just level with the snow. But Brer' Rabbit, himself wishing to know his whereabouts, as one facetiously remarked, had burrowed around it and kindly left its "4¹/₂" exposed to full view.

Before we reached this point, however, our spirits received a sudden chill. The sun disappeared, and a gray mist suddenly enveloped us. We knew what it was. The clouds we had seen from the camp, about the mountains in the far west, had begun to roll upon our mountain side; and what the chances ahead would be could only be told when we had cleared the forest. We pushed ahead, the last steep climb past, every opening in the diminishing growth revealing sufficient cause for anxiety. Soon we saw the ledges ahead, and made rapidly for the last dense clump of low timber, to escape the piercing, moisture-laden winds that now began to strike us. This we reached at a little before half-past one. Here we donned all our clothing; wraps and ulsters, hoods and caps, were well adjusted, light gloves exchanged for fur mittens, scarfs securely fastened, and out again we marched, — now in the teeth of the wind. We clambered up the ledges, dodging around the rocks, avoiding the glary crust, and selecting each for himself the spots where the shoe might find a slight coating of snow, or the toe crunch a footing in some feeble crust. All was changed. There was hardly a flake of snow that could blow away, but the shallow gullies gave a tolerable foothold. We soon flanked the first ledge and gained the summit of the second, and now we could see the state of things. Off on the western horizon lay a dense mass of clouds. Rank upon rank, they filled the space between. One line had just passed us and we were in the sunshine; but we could see little on either side, excepting when an occasional rift revealed a scene of glory. So it would doubtless continue, and the chances of any views would diminish as the day wore on. Here, then, we divided our forces, half remaining and half proceeding, one of the guides with each

party. Those who went no farther sought the leeward side of the ledge before descending, and, picking out sheltered spots behind the rocks, sat for ten minutes, careless of the cold and wind, enjoying such passing glimpses to the north as could be gained. They then returned to the camp in a leisurely and comfortable way.

The others doffed their snow-shoes and armed their feet with "creepers,"—pronged iron plates securely fastened below the instep. When ready again for the start, the clouds had fairly settled down upon the mountain sides; but the little cairns of white stones which mark the summer path could still be seen, even against the snow. This serves to show the small depth of the snow above the trees, save in the hollows, which the summer path naturally avoids. At times the passage was over the ice, or over a crust stiff enough to bear one's weight; while at other times considerable distances were passed over weak crust through which one sank half-way to the knee. With varying fortune, through mingled sunshine and cloud, the little party of three kept on until they reached the peak known as Adams 4,¹ which is about a kilometre from the summit, and about one hundred and fifty metres below it. Still they pushed on; but the difficulties increased. There was first a broad plateau to cross, with gentle, upward slope, over which a wind of twenty miles an hour, laden with frost, was blowing. Beyond that the sharp, steep cone of Adams, with its huge masses of jagged rocks. The clouds became more and more dense, and obscured the landmarks. The moisture of the breath, freezing upon the wraps about the face, seriously interfered with breathing. So when, at quarter before three, half the distance beyond 3^h.4 was reached, and a height of about 1,620 metres had been attained, a hurried consultation decided that prudence and the lateness of the hour demanded a return. "It seems a pity," said they, "to be so near and yet so far; but prudence is the wiser thing."

Up-hill and down-hill on the ice are two different things, and it was not long before the forest line was reached again. The wind, to be sure, was in their faces; but the descent to this point was mere child's play compared to the toilsome climb.

¹ See APPALACHIA, Vol. I. Pl. VIII. 3.4 a.

It was not always safe to keep one's feet; so this was diversified by many a slide upon the back. If attempted erect, by balancing upon long legs, one was liable to mishaps such as befell one of the party, who cannot tell to-day just what happened, and nobody else knows. At the bottom of a stretch of ice some fifty or one hundred yards in length, while "going like a rocket," his foremost foot struck a projecting bit of ice, whereupon he shot forward in mid air, and landed a rod or more below upon his face, rolling over and over until a snow-drift stopped further progress. This battle-scarred warrior was the recipient of unusual attentions that evening around the fire, his features lending veracity to his tale.

At the timber-line the snow-shoes were again brought into requisition, and proved as useful in descent as in ascent. In the steep places all one had to do was to stoop and shoot downward until a tree was struck or caught; so it became a series of zigzag dashes, in which one must be ever on the alert. On the less steep portions of the path one merely took long steady strides, which made the kilometre signs pass rapidly to the rear.

The Appalachian camp was reached at quarter after four. Some of the first return party had already left, strolling leisurely down; but there was a fire at hand, and hot tea. It was curious to see how little effect the blazing fire had had upon the snow sides of the pit in which it had been built; and though the sandwiches had been placed beside the fire at the bottom of the pit for more than an hour, bread, butter, and meat were frozen solid, and the effect of crunching them was very peculiar. Three quarters of an hour were spent here, and then the downward dash was again resumed, but with less recklessness, for it was already growing dark in the woods, and when the forest was left it was hard to follow the more obscure trail across the meadows. But this was scarcely needed; and soon, the lights of the Ravine House coming in sight, no further care was taken, and by quarter after six the last of the party was safely housed, the ascent having taken seven hours and the return one half that time.

It is the unanimous feeling of the members of the party that a complete ascent of Mt. Adams in winter is perfectly

feasible, and not extremely difficult. The following day was perfect throughout, and had that day been chosen there can be no doubt that the summit would have been reached without much difficulty by the whole party. The start should be made by six, however, to give ample time. Heavy overcoats are not needed, even above the forest; but leathern vests and cardigans are recommended, and a not too heavy hooded coat, the hood projecting so far in front of the face as to readily serve to protect it from lateral winds. Most of the party wore extra foot-gear; but the writer simply wore arctics over his ordinary winter boots, and did not suffer for an instant. With the experience we have had, another winter is hardly likely to pass until Adams is ascended from the valley of the Moose.

Optical Illusions among the Mountains.

BY CHARLES E. FAY.

Read December 19, 1888.¹

A FEW years ago, while staying at North Conway, my attention was attracted to one of the most common of those tricks of vision which prepare for us so many pleasant surprises in these beautiful regions. I refer to the great increase in the apparent height of the Mt. Washington Range, as seen over the Saco Intervale from the edge of the terrace opposite the Intervale House. Dwelling upon it, and associating it with other experiences, I determined to collect data, experiment, and possibly prepare a paper on the subject, — although the theme is remote from my usual field of studies, — and even went so far as to make a few notes as occasion offered. Time and opportunity have not favored any thorough or consecutive study; and in the meantime there has appeared, in the annual of the German and Austrian Alpine Club, a paper bearing the title of this article, which treats quite methodically the general

¹ Also at North Conway, September 4.

subject of optical illusions in natural scenery, and offers an explanation of some of the very phenomena we had noted.

I propose to make this interesting paper of Herr August Böhm the text to what is here presented, but shall so weave in my own observations and experiences that the reader will have some difficulty in following my prototype. I therefore refer any desiring to do justice to him to the original article.¹

He begins at the beginning, with Brücke's definition of seeing, — "the coming to a consciousness of the condition of the optic nerve," — and deals first with some of the general facts of vision, presenting the proofs of the falsity of certain common notions of what we see. Thus he shows, by pertinent illustrations, that we do not see the material of which a body is made, its position in space, its form, size, distance, state of rest or motion. These are all the result of inferences made with astonishing celerity, and usually unconsciously. At the most, following his theory, we see a tiny, superficial image on the retina, — inverted, at that, — and with this minimum of capital and gradually increasing experience, we go on, for a lifetime, drawing inferences, — in the majority of cases that have to do with our every-day life, near enough for all practical purposes, yet oftentimes very wide of the mark, as to these various notions of form, size, distance, etc., which we do not get directly by the sense of sight.²

¹ Zeitschrift des Deutschen und Oesterreichischen Alpenvereins, 1883, p. 161.

² Allowing, in the lack of an opinion of my own as to the general theory of sight, the claims of the empirical theory, which derives all of its data from experience, I desire to take issue with Herr Böhm, and possibly others, as to whether infants actually see things wrong side up, and only learn by experience to correct their impressions. He says we may convince ourselves of this by noticing how young infants reach awry after the objects they wish to grasp. I have not observed this very markedly in my own family, and had I done so, should have attributed it quite as much to manual as to visual inexperience. Again, as the eye of animals is constructed on similar principles, would not one expect most extraordinary behavior on the part of young calves, colts, chickens, and other precocious children of the sort, and be inclined to marvel even more at their mental than their physical precocity, observing the speed with which they acquire experience in this delicate matter? Is it not more credible that to heredity — the transmitted, cumulative experience of the ages — we owe it, that we not only do not, but by the most persistent effort of the will *cannot*, see things inverted, as, of course, they are depicted on the curtain of the eye. For the more generally accepted scientific view, see Le Conte, Sight, p. 83.

The instances which our author adduces in support of his statements as to what we do not see, but merely infer, are taken from common life, and are very interesting. What he says with regard to our apprehension of size and distance, I will briefly reproduce. Apparent size and distance stand inversely related to each other; as either increases, the other diminishes. When, therefore, the size of an object is known, we can infer its distance; and when the distance is known, we can infer the size. Now, if neither is known, we seek to deduce one of them in some other way and then infer the other. In this case it is always easier to form a judgment as to distance rather than size; for while the inference from the apparent to the real size can rest only on the datum of distance, other data than the relation of apparent to real size are at hand in estimating the distance of an object from us. These are four: 1. The intensity of its illumination,¹ which decreases as the square of the distance, and in virtue of which a bright, clearly defined object seems nearer than one more obscure. 2. The angle of convergence, made by the axes of the two eyes, which must intersect in the object looked at. This angle increases with the nearness of the object, and we become conscious of this increase through the effort made by the muscles of the eyes in bringing them into proper position for clear vision. 3. The accommodation of the eye, which must be focussed anew for varying distances;² this is accomplished through the eye's changing, by muscular effort, the curves of the crystalline lens. 4. The comparison of the unknown distance with the known distance of some other object. The more objects there are between us and the object at indefinite distance, the more accurately we judge of that distance; for the glance meets stations in its flight which serve to make the goal seem the remoter. If few or no objects intervene, we are very liable to underestimate distance. The truth of this will be well apprehended from Fig. 1. The

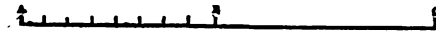
¹ "Stärke der Beleuchtung,"—though Herr Böhm seems to be speaking of the amount of reflected light received from the object.

² The limits within which this and the preceding criterion furnish data are so narrow that they practically have little or no bearing on the present discussion.

distance from A to B seems equal, perhaps, to that from B to C. In fact, it is shorter by one of the small divisions.

Herr Böhm illustrates this point by citing the deceptions we experience in estimating distances across the surface of

Fig. 1.



lakes, on snow-fields and glaciers, and mentions a curious notion prevalent among Al-

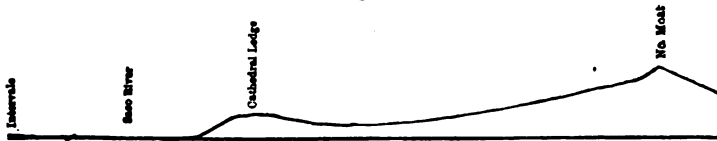
pine hunters, who say that in shooting you must take account of the ground over which the ball flies, for snow attracts the lead downward, and rocky surfaces cause it to rise,—a popular fallacy, arising from the fact that, the distances on the snow-field being underestimated, one does not aim high enough to make proper allowance for the parabolic course of the bullet, while over rocks the reverse is true.

Some illustrations of illusions such as are constantly befalling us among the mountains, owing to this tendency, may here be cited.

From the piazza of the Black Mountain House, in Campton, the noble peak from which the hotel has its name is seen rising grandly above a belt of woods, beginning but a few hundred yards distant, and which completely screens the long intervening stretch of the Mad River valley. One day some strangers to the place started for their first early morning run to its summit,—seven miles away in an air-line. How overwhelming must have been their first impression of its nearness, that they did not postpone their visit on reaching some spot from which the intervening space must have become more apparent! But it was a very clear morning, and therefore the continuance of their deception is not so strange, for the illusion of nearness from clearness of definition is, perhaps, the most delusive; but surely, if they had first seen the peak from Campton Hill, from which the valley has its full importance in the view, and farm after farm is seen strung along the winding road that leads to its base, they never would have started breakfastless to ascend Black Mountain. Just so, on the Conway side. No one who has not been over the ground is prepared to appreciate the distance to Moat Mountain, and particularly that portion of the distance between

the Ledges and the crest of the ridge. One would say that, once arrived on the Ledges, it would be no distant climb, though perhaps a steep one, to the north peak. To realize these distances, go to the summit of Mt. Washington; your line of vision is now perpendicular to a line joining the points mentioned. It is a revelation. The accompanying diagram (Fig. 2), constructed from the State map, represents the relative distances of the Ledges and the summit of North Moat from the Intervale railroad crossing and from each other.

Fig. 2.



In no way does one more fully realize the extent of this illusion than when, having attained the summit, he looks backward to the point of departure. It is an ever recurring source of surprise, which I think no amount of experience can overcome. Perhaps it had seemed but a good rifle-shot from the hotel piazza to the top, — you would call for a Krupp cannon of the newest make to send your compliments the other way. From your lofty position the number of intervening objects is far greater than was appreciable from even the most favorable position below, especially those upon the slope itself; so much the more, therefore, the point of departure seems to recede. I have seldom, however, been more surprised by an illustration of this fact than at our last evening meeting, when Mr. Pickering presented a lantern slide of his photograph from the summit of White Horse Ledge, wherein Echo Lake appears well out in the middle ground of the picture. To be sure, I never visited the lake but once, twenty years ago, on the occasion of my first trip through the mountains, though I have often been at Conway; but in the meantime, if any one had told me that it was possible to throw a stone from the top of the Ledge into the water, I would not have been surprised. Our President, Mr. Worcester, tells me that many people incorrectly suppose the echo to be sound reflected from the cliff.

It is particularly in the remoter part of the landscape, of course, that we lose our power to appreciate the distances intervening between visible objects. Trees and rocks having no fixed size, we can infer little or nothing from their apparent magnitude as to nearer and remoter; and the mind gives up the task untried, and vaguely accepts them as being all in a common plane perpendicular to the line of vision, or perhaps lying in a few planes no great distance apart.

The latter condition is sometimes strikingly apparent. Descend a mountain stream, and you will be astonished how interminable the journey seems, as you pass reach after reach of its rocky bed, swinging in your course around a dozen, more or less, of jutting spurs. As you look back from some elevated point opposite the mouth of the stream, you may perhaps be able to count these very spurs; but you cannot realize, except in memory, the distances that separate them. This is especially noticeable in the view of Black Mountain from the hotel, which faces the broad ravine out of which the east branch of Mad River descends in plainly indicated zig-zags.¹ Several of the lateral spurs of the great southwest ridge are discernible in favorable lights, their apparently neighborly parallel slopes looking innocent of any intent to deceive. It would require an hour and a half of steady walking to pass them all! Another instance of a similar illusion is seen in looking at the head-walls of the great ravines in Mt. Adams from Jefferson Highlands. The broad ravines themselves are annihilated. We see only the upper part of the walls, as if superposed one on the other.

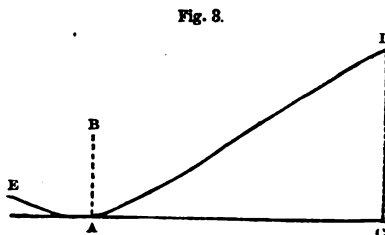
Herr Böhm characterizes these illusions which have to do with angles of slope seen from in front as "the most popular illusions," and in explaining them as due to the lack of criteria of distance, calls attention to the fact that when we stand at the base of a high wall and look up, it seems overhanging; if it be a tower, it seems to be toppling over upon one, which he explains on the same principle, and, indeed, from these instances deduces his explanation of the exaggerated angles of slopes seen from in front. In

¹ See APPALACHIA, Vol. I. Pl. IV.

these he thinks the effect is heightened by the increased illumination (clearer definition?) of the upper part of the slope.

Now, it is evident that any increase in apparent steepness is attended by a corresponding reduction of the apparent distance that would separate two parallel planes

(A B and C D, in Fig. 3) passed perpendicularly one through the foot of the slope and the other through its top. The steeper the apparent slope,



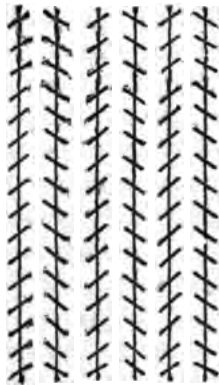
the nearer these planes must seem; and they would coincide in an apparently perpendicular mountain side. Theoretically, the farther you are away from the mountain, the less appreciable is this distance, and the steeper the slope appears; but other conditions complicate the matter, especially the effects of light.¹ Certain it is, that long distance is not necessary in order to produce the effect of exceeding steepness where it does not exist. Let me cite a familiar case in point. All have taken the trip by rail through the Notch, and have no doubt been profoundly impressed by the steep wall of Webster, rising opposite in the upper portion of this great ravine. Its scarred flanks confront us, apparently inaccessible; one almost wonders that trees can find a foothold, and doubtless approves the language of his poetical companion who speaks with awe of "the sheer precipice frowning down upon the Saco." Suppose we are just passing above the Willey House. The horizontal distance to the river is perhaps eight hundred feet, and the mountain begins to rise almost immediately. Let us call it thirteen hundred feet, or a quarter of a mile, to the foot of the slope where we pass our first plane. How far back of this must we pass the second, that shall intersect the crest of Webster? Taking Mr. W. H. Pickering's new contour map,—the best existing authority,—we find it must be at a distance of about forty-seven hundred feet,

¹ See pp. 335, 336.

or more than seven eighths of a mile, farther from us. Now the height to be ascended in this distance is about twenty-seven hundred feet, which speaks for an *average* slope of only 30° from the horizontal. Of course, in places it is very much steeper. Fig. 3 represents a section of this slope, constructed on the basis of Mr. Pickering's map. The average slope of the mountain along which the railroad is constructed is apparently fully as steep as that of Webster.

Our author, in continuing, adduces other instances of illusions arising from a false estimation of slopes and distances, as those which occur in judging the relative height of points upon ridges running obliquely to our line of sight, but whose obliquity is not apparent. Here the higher point may easily appear the lower, and an ascending line may seem horizontal or even to descend,—a fact whose recognition leads the experienced mountaineer to hazard an opinion as to which is the highest point on a ridge with more caution than the novice. Mention is also made of the apparently heroic size of objects upon a crest as seen projected against the sky, and hence referred to the sky's indefinite distance,—especially the forms of persons and animals,—and the apparent remoteness of near objects in twilight or in mist, due to imperfect illumination and definition.

Fig. 4.



Finally, a class of illusions of a different nature is discussed; and while with no less clearness than the others, I confess to feeling by no means satisfied with the explanation given by Herr Böhm. These he calls "illusions through the subjective sentiment of contrast," and introduces the subject with the presentation of Zöllner's figure (Fig. 4). The long vertical lines are parallel, however far from being so they may seem.¹ The illusion is thus explained. The relation of each pair of long lines which do not converge is in contrast with the relation of

¹ To produce this illusion most effectively, hold the page horizontally and look diagonally across the diagram.

the short parallel lines of each pair which do converge. Now we apprehend this contrast very vividly, and even assume it to be greater than it is. To make it greater than it is, the long lines would have to diverge in the direction toward which the short lines converge, and thus we apprehend them.

Such strong sentiments of contrast, no doubt, produce their deceptive effects in the mountains. On this ground our author explains, and doubtless correctly, the two following cases:—

When one has been ascending for some time a uniformly inclined slope and turns and looks back, he is surprised to find the slope so steep, steeper than he had observed it to be while ascending. On the other hand, if he has been descending a similar slope and turns and looks back, he finds the upward slope steeper than that just now before him. In each case he had become accustomed to a slope in a certain direction. In turning about, the contrast of the slope in reverse is most vividly apprehended, and the mind exaggerates it and deludes our judgment; the eyes are made, if not “the dupes of the other senses,” at least of the imagination. Herr Böhm then proceeds to deduce from these facts the explanation of certain well-known phenomena. He asks: “How would it be if in turning back while ascending we could look upon a horizontal plane instead of the descending slope?” Naturally, he says, it would seem to dip from the horizontal by the same amount that the continuous slope seems steeper than it is. Accordingly, if a plane seemed horizontal, we should assume that it was not so, but sloped upward to some extent. Thus he explains illusion that always falsely encourages novices in mountain climbing. They glance across the valley to the side of some other slope, or to some mountain known to be of about the same height as that they are ascending. Imagining that they are looking horizontally, they are rejoiced to see how high they have attained. In fact, they are sighting considerably above the level, and are quite downcast when informed that they have only reached the height of some point considerably lower. Suppose, he continues, that in descending we could look

suddenly upon a horizontal plane in turning back. By the same effect of contrast, it would seem to rise from the horizontal by the same amount that imagination would have exaggerated the continuous slope.

By an extension of the same principle, Herr Böhm accounts for the fact that neighboring peaks of even less elevation than that on which we stand seem higher than it, and that, as one descends obliquely the side of a ridge facing the direction in which runs the stream at its base, the water seems to be flowing up-hill.¹ By the same principle,—taken in connection with that already discussed, the exaggerated steepness of slopes seen from in front,—he explains the often noticed illusion to which we are subject in descending into a col, or saddle. As we look across from one slope, the other seems to rise much more steeply, and perhaps higher, than the one we are descending. Those who went across the Twin Mountain range in July with the Club party had ample occasion to notice this fact. How much higher the South Twin looked from the southern slope of the North Twin; and again how much higher the North Twin appeared from the northern slope of the South Twin! Attention is justly called to the fact that there is no such illusion when the rise looked on is comparatively short and begins at a great distance below us. So far away, the eye fails to appreciate its elevation above the general mass of the mountain, and it loses all relief. It is almost the converse of the case of increased apparent steepness of a slope seen from in front. The same effect is produced in looking upon the other mountains from a peak pre-eminently high; and this is why Mt. Washington is a far less satisfactory view-point than many a humble hill.

While recognizing the ingeniousness of Herr Böhm's argument, we are forced to believe it fallacious, and that all the phenomena provided for by his deductions are to be ex-

¹ This latter illusion, he says, cannot arise if the descent of the brook-bed equals or exceeds the amount of our exaggeration from the effect of contrast. It would be interesting to know whether this has been determined by observation, or is simply an inference from his premises. The probabilities are in favor of the latter supposition, inasmuch as no reference is made to any attempt to determine the personal equation for this purely subjective error; and, with this undetermined, no statement of fact could be made.

plained on entirely different principles. First of all, it is very doubtful whether we are permitted to argue for imaginary planes from data furnished by experience with actual slopes. Then the explanation of the novice's error is invalidated, if it be true—and I think it is—that he would remain in error if he should sit looking across at the opposite slope for hours, or at least until long after the impression he gained as he climbed had passed away, and with it, of course, the sense of contrast. It seems unwarrantable also to treat as identical the case of a person descending a continuous slope and that of a person tarrying on the summit, and on this ground to explain the fact that lower peaks some distance away seem higher than that on which we are standing.

The primary cause of this interesting illusion we conceive to be of a very different character,—namely, the tendency unconsciously to assume as horizontal the plane upon which we happen to be in a state of rest, at least when the mind is preoccupied with other things, as the distant prospect.

So important an assumption requires more than a passing notice. It will no doubt be agreed that no relative position, no plane, is so familiar to us as the horizontal. On the floors of our houses, where we crept as infants, walking the grades of most of our streets, sailing our bays and rivers, lying in our beds, from the day of our birth we live upon the horizontal plane. Of planes inclined to it, except its perpendicular, we have the vaguest idea. Slight variations from it we fail to apprehend. What is yet more important, our apprehension of it must be acquired by us in its relation to our own body, erect upon it, and consequently more or less intimately involved with our sense of poise. What is more natural, then, than that, by the mind in its passive state, the every-day plane is unconsciously assumed to exist where it is not, and particularly if the departure from it is not great. An additional reason why we should err on the side of its depression as we look across a valley may possibly be found if one considers how little we apprehend the true position of the zenith. Of nadir we have a more complete idea, since our feet we see and our crown we do not see. Few realize that it is necessary to sweep an arc of about 70° to traverse

the sky space between the highest limit of our vision with head erect and the zenith point. Our unconscious estimate of the 180° between zenith and nadir being an underestimate, caused by a deficiency in the upper quadrant, it would seem quite natural that we should imagine the horizontal plane which bisects this angle of 180° at less than 90° from the line of our lower limbs projected,—in other words, as a somewhat descending plane. Though little depends upon this particular argument, it seems worth while at least to note the fact.

A variety of illusions met with in our daily life elsewhere than among the mountains are examples of this same irresistible tendency to misinterpret the position of the horizontal plane. In descending a grade, the road seems to rise more or less steeply before us. On reaching the change of grade, it proves to be much less steep than it appeared, or even actually level. This illusion is much enhanced if one is riding, particularly on a high seat, as on the top of a coach. Grades which to the pedestrian seem but ordinary now seem "horribly steep," and correspondingly exaggerated is the ascending slope that awaits one. So, too, the sea horizon seems higher than the deck of our vessel, and thus in part is explained the beautiful illusion which perhaps all of us have experienced when, after sunset, some belt of cloud is resting high above the horizon. Often the intervening sky seems a bay or inland sea, perchance studded with islands if there are detached clouds upon its surface. The lower edge of the cloud seems its distant shore, the vague true horizon appears comparatively near, while the upper edge is assumed as the real horizon. In this last instance, however, we are less occupied with the consideration of elevation than perplexed in determining where in the vertical plane upon which our pictures of the outer world are, as it were, projected, the boundary line of earth and sky is to be located,—another aspect of the same problem.

The foregoing explanation suggested¹ itself to me in seek-

¹ Since writing the above, a complete support of this view has been found in a work entitled "The Five Senses of Man" (International Scientific Series), by Professor A. Bernstein, of Halle, page 154.

ing to account for the greatly increased apparent height of the Mt. Washington range as seen from opposite the Intervale House. The usual explanation, that it is because it is seen across a valley, did not seem adequate—even allowing it to be an explanation—when one considered the shallowness of that valley. The height above the Saco is, perhaps, fifty or sixty feet. Now, if one takes into account simply the angle of depression to the place from which the land begins to slope the other way, its variation from the horizontal plane would account for but a few hundred additional feet of apparent height,—a matter hardly appreciable. But no one can tell by ocular observation where that change of grade begins, so gradual is it; and we unconsciously assume it to be, as we think, not far from the base of the little bluff itself: the exact place is, from the conditions of the question, variable and doubtless indeterminate. Assuming this depression as the horizontal plane, the angular distance from it to the crest of the ridge would be several times the true angular height of the range. That such a ratio of increase would not produce an astounding effect on the observer is evident from the readiness with which the unskilled person accepts as perfectly natural the sometimes astounding exaggeration of the angular height in pictures of natural scenery.

On this hypothesis, also, may be explained an illusion that once befell me while resting at the top of the head-wall of King's Ravine. This wall descends at a rapid slope to the rocky floor of the upper portion, and beyond the boulders the lower ravine, forest-lined, falls gradually away to the valley of the Moose River. Beyond rise wooded mountains. My eyes resting for a time on the lower portion, I was surprised to notice that it had the appearance of an ascending instead of a descending slope, and I seemed to be looking into a great "hopper." The illusion was not continuous, but was once or twice repeated.

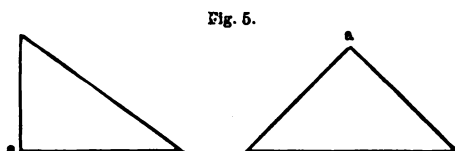
By the fact just referred to, that it is often beyond our power to detect gradual changes of grade in the landscape, and especially so when the sun is so situated as to make less marked shadows, we may account for an illusion that evidently

occurred to a little boy in Cambridge, whom I met one day walking through Raymond Street. The street goes over a slight hill. As the boy and his father came over the brow, the latter said, "That hill yonder is Arlington Heights." "What hill?" said the boy,— "that one down there?" and as he looked in the direction indicated, he actually pointed downward with his finger. Turning about, I found it quite possible to create the illusion. It only required one to imagine a continuous plane to the horizon; and with the even distribution of midday light this was no great tax on the imagination.

Hence we think that all the cases which Herr Böhm accounts for by deduction from this principle of contrast are better explained in another way. But there are one or two possible applications of it to which he does not allude. Using his own logic, by the way, it would afford an apparently sufficient ground of explanation for the increase of apparent slope as seen from in front. By this principle may be explained why any marked descent suddenly approached, when walking on a level or coming over the brow of a hill, seems unduly steep. Certainly those of us who made the descent of Mt. Crawford by the impromptu path the day after the North Conway meeting had a fine illustration of this when we came upon that break-neck precipice which we ventured to descend. At the first glance it seemed out of the question to descend its face; and how its two hundred feet or more beetled over us as we gazed up to it from the *terra instabilis* at its base along the vertical lines of maximum decomposition of the rock! and yet, save at one or two points, we did not find it so uncomfortably steep.

Neither does Herr Böhm call attention to this principle in its bearing upon the common exaggeration of the vertical in profile lines, nor, indeed, say anything of this interesting illusion. We find fault with our artists who portray their mountains unduly steep. Let us be judicious with our criticism. If the artist who exaggerates the vertical does so simply "for effect," if he would allow that he did not see the slope so steep as he has represented it, his work is reprehensible. But it is, we think, no less true that his picture would fail to represent the scene as apprehended from the image on the retina of the average spectator, if it represented a mountain

on the canvas as no steeper than in a camera profile. The mission of an honest picture being to reproduce the effect of the scene itself, neither exaggerated nor attenuated, it must reproduce those slopes as ordinary persons, not skilled observers, see them,—that is, exaggerated. The exaggeration is due, we conceive, to this same effect of contrast. All in-



inclined lines in the profile slope up or down to other lines which mutually heighten each other's apparent inclination.¹

In preparing this paper for its second presentation to the Club, we made it our duty to refer to a work of such supreme authority on this and cognate subjects, that we now wonder at our boldness in having ventured to treat it at all, at least without having previously consulted its pages. We refer to the "*Handbuch der Physiologischen Optik*" of Helmholtz. Under the head of "*Illusions in Ocular Estimates*," he refers to the following principle set forth in his treatment of the phenomena of contrast, namely: "Clearly recognized differences in all sense perceptions appear greater than vaguely recognized differences of the same objective magnitude." Then, after setting forth some illustrations of the principle,—among others, one with two equilateral triangles made up of parallel lines gradually diminishing to a point, and running in different directions in the two figures,—he appends the following interesting statement, in which it is only necessary to change the terms slightly to make it the very case under discussion: "Here also might belong a fact observed by Beauvais. He reports: If an observer who is at sea, at some distance from a coast which

¹ A curious illustration and complication of this principle is found in the fact that the right angle (α , Fig. 5) in a triangle seems smaller when, the hypotenuse being taken for the base, the right angle is the apex, than when the triangle rests perpendicularly before us upon one of the other sides. But since in both cases the right angle is formed by the meeting of two lines having the same absolute relation to each other, why is not the angle apparently as much diminished in the one case as in the other by the sentiment of contrast? We conceive this to be due to our great familiarity with the relation of perpendicular and horizontal.

presents marked topographical irregularities, draws it as it appears to his eye, he finds by mathematical calculation that in the drawing thus made horizontal linear distances are estimated in their proper mutual relations, while the vertical angular distances are estimated upon a scale twofold greater. This illusion, to which one is involuntarily subject in estimates of this sort, is not individual, as one might imagine; but numerous observations prove its universality. Nearly related to these cases are various optical illusions that have been discovered in recent times."¹ He then cites some of these, and among them one which he characterizes as most remarkable of them all, — Zöllner's figure, with which Herr Böhm's treatment of the subject of the sentiment of contrast was introduced.²

The illusions to which your attention has thus far been called are, for the most part, of a plain every-day sort. Besides these, there are of course many others of rarer occurrence, perhaps experienced but once in a lifetime, and hence all the more sensational. It is naturally beyond the province of a single paper to treat of such; but I cannot forbear to present a case to which my attention was lately called by our fellow-member, Mr. P. A. Ramsay. I quote from his letter: —

"It occurred on the evening of the day when we made the ascent of Cherry Mountain. The evening was just at hand when the carriage started [from the foot of Owl's Head] for the Twin Mountain House, and by the time we were within about an eighth of a mile of the house the twilight was fairly upon us. It was just here, where the southerly portion of the Presidential Range should be in full view, that I turned my eyes in that direction, and, lo! the mountains had subsided almost into the earth! Their profile was there, indeed, but it was only just above the level of the valley. It was as though an immense sheet had been let down between us and the mountains, having at its lower edge

¹ Allgemeine Encyclopädie der Physik, IX. Helmholtz, Handbuch der Physiologischen Optik, p. 564.

² All that we have been inclined to maintain for years in discussing the rights of artists to exaggerate, within certain limits, the objective vertical, is supported by this leading scientific authority, not only by the implications of this statement, but by these words from another portion of the same work: "It is essentially the appearance that interests us, whether we seek to imitate them as draughtsmen or investigate them theoretically as physiologists."

an irregular outline answering to their profile. A peculiar sensation came over me as the question came up in all earnestness, 'Where are the mountains, — Monroe, Franklin, Pleasant, and Clinton?' 'I beheld, and, lo! they were not.' But directly I suspected the illusion, though all unlooked for, and immediately took note of the locality where we were, and we went on to our hotel. The next morning, in full daylight, I walked back to the exact spot where I had witnessed the wonderful scene, and the mountains were all in place, with their outline high against the sky, as it should be.'

All the conditions under which this illusion occurred are not given, but we can imagine certain ones that would favor it. Every one knows how, when one is on some elevation, mists will sometimes fill an intervening valley over which the summit of a range appears as a long island, preserving its profile, but forfeiting a large portion of its height. I have noticed that a similar effect can be produced by the valley's being filled by mere obscurity, obliterated to all intents and purposes by the dusk, with perhaps some slight addition of smoke or haze. So Arlington Heights have appeared across from my study windows. To be sure, that is a westward view, and Mr. Ramsay's was towards the east, which is less favorable. Had there been a bank of cloud above the horizon, it would have had a tendency, as we have already seen, to produce the same effect.

In conclusion, I wish to mention a very interesting phenomenon which is seen to the best advantage among the mountains. I hardly know whether to call it an illusion or the dispeller of illusions, for in certain respects its data are particularly in consonance with reality. Perhaps many of you know the strange effect produced in the landscape with the head inverted, though the unnaturalness of the position renders the experience rare. An unsatisfactory expedient is to curve the arm and look under it. To most persons, I think, a most remarkable change will be apparent. The scene has gained in depth, the horizon has moved away, and the coloring of the landscape has assumed a soft, bloomy character that heightens its loveliness. Now, if the horizon retreats and the observer remains stationary, what becomes of the depth of space thereby apparently gained? It is distributed with a large apportionment to the remoter parts, — between

those planes which with erect vision seemed unduly near each other. As a result, not only does the mountain summit seem removed to something nearer its normal distance, but as a necessary corollary the slope seems less steep than before. If a ridge reaches out toward you, it is no longer foreshortened and lost in the general mass, but stands out stereoptically. Moreover, the sloping lines of the profile are flattened, and the outlines of the mountain more nearly coincide with the less pretentious productions of the topographical camera. I say to most persons; for to my surprise two such eminent experimenters in physical science as Professors E. C. Pickering and C. R. Cross tell me that they are not conscious of any change, at least in perspective effect. While on the peak of Lafayette, in 1881, with the last-named gentleman, we tried the experiment. It was at the time of large Canadian forest-fires. When we left Sugar Hill for the ascent, Lafayette was but faintly discernible through the milky haziness. Before we reached the summit a brisk westerly wind had sprung up and driven out the smoke, now coppery in color, so that it formed the background of the eastern mountains. Only a fairy land could present such marvellously toned splendor as we witnessed with inverted eyes. The softened azure of the cleared sky, the dun copper hue of the distant smoke cloud mellowed to the translucent blush of a rose petal, the blended wealth in greens and grays of the subdued tints of forest and rocky ridges, made almost "a new heaven and a new earth." Though reporting no changed appearance as regards apparent distance, Professor Cross was as impressed and delighted with the heightened color effect as myself. Perplexed as to the testimony of two such authorities, I have since asked many persons ignorant of the result to try the experiment and report their sensations. Almost invariably their experience has agreed with my own. I inferred, therefore, that long-skilled observers in optics are not fair criterions for the world at large; that their habit of accurate observation has made it almost impossible for them not to see things as they are.

Assuming, then, what we have reported to be the common effect of looking at the landscape with inverted vision, it becomes a very interesting problem to explain it. A very

common and, at the first glance, plausible explanation is that it is the result of congestion, though just how is not manifest. But it ensues at once, before congestion has had time to supervene, and does not intensify or change with the increase of congestion. It is even apparent in a less degree with the head merely on one side. Mr. W. H. Pickering supposed it to be due to the chief part of the picture being made upon a portion of the retina unaccustomed to seeing the things on which we familiarly pass judgment.¹ If this were the cause, it would seem as if similar effects would be observed in viewing near objects, which does not seem to be the case. Calling to mind that, owing to the setting of our eyes and our customary head-gear, we are practically unacquainted with a very large portion of the sky, much of which becomes visible with the inverted head, and occupies upon the retina the place of the usual foreground of the picture, we thought we had found in the existence of this broad foreground a satisfactory basis of an explanation. In it we have a *terra incognita*, so to speak, with no intervening criteria of measurement. It would then be quite natural to refer our horizon to the indefinite distance of the sky; and this, when apprehended indefinitely, is assumed to be very far away, perhaps as far as the remotest horizon we ever gazed on. On trying the experiment of cutting off this large foreground of sky, the result was no less pronounced, and this theory was brought to nought. So, too, the fancy that the great additional quantity of blue might, by influencing the color sense, affect the perspective, seemed to be destroyed by finding the results the same, at least as regards perspective, in cloudy weather and to some extent by moonlight.

But, as I say, a good genius led me to search the pages of Helmholtz, and not in vain. This is what I found bearing upon this interesting subject. In speaking of the difficulty

¹ While reading this portion of the paper at North Conway, a suggestion made to me by Professor A. E. Dolbear, that it might be due to the left eye and right eye changing work, recurred with especial cogency, and the remark was hazarded that possibly the most promising line of investigation would be found in studying the effect of inversion of the eyes upon binocular vision.

of analyzing compound sensations which are always excited concomitantly by the same simple object, he says:¹ "The perception of the corporeal form of a tri-dimensional body rests upon the combination of two different perspective views of the two eyes. The apparently simple quality of lustre of a surface rests upon the different coloring or brightness of its image in the two eyes. These principles have been discovered theoretically, and can be shown by proper experiments; but it is for the most part very difficult, often impossible, to find this out merely by direct observation and analysis of the sensation. Even in much more complex sensations which correspond to a frequently recurring complex object, the analysis of the sensation is rendered all the more difficult for mere observation, the more frequently this combination has recurred and the more we have grown accustomed to regard it as the normal sign of the actual nature of the object. As an example of this, let us take the well-known experience that the colors of the landscape come out much more brilliantly and definitely when looked at with the head sidewise or inverted than when in its usual upright position. In the usual way of observing, we seek merely to judge correctly of objects as such. We know that green surfaces at a certain distance appear with a somewhat modified tint; we accustom ourselves to turn the mind from this modification, and learn to identify the modified green of distant meadows and trees with the corresponding color of nearer objects. In very distant objects—distant mountain ranges—little of the body color is left to be recognized; it is mostly overpowered by the color of the illuminated air. This indefinite blue-gray color, which is bounded above by the bright blue field of the sky, or the ruddy yellow of the evening glow, and below by the vivid green of the meadows and woods, is very subject to changes by contrast. It is to us merely the indefinite and varying color of the distance, the variation of which at different times and in different lights we notice quite plainly, while we do not determine its exact nature, inasmuch as we are not called upon to transfer it to any definite object and know its varying

¹ Handbuch der Physiologischen Optik, p. 433.

character. If, however, we put ourselves under unusual conditions,—for example, look under our arm or through between our legs,—the landscape appears to us a flat picture, partly on account of its unusual position in our eye, partly because the binocular judgment of distance becomes more inaccurate. Indeed, it often occurs that with inverted head the clouds assume a true perspective, while the objects on the earth appear as a painting on a perpendicular surface, as usually the clouds do in the sky. At the same time, also, the colors lose their relation to near and remote objects, and present themselves to us pure with their peculiar differences. Then we recognize the fact without difficulty that the indefinite blue-gray of remote distance is often a quite fully saturated violet, that the green of vegetation gradually passes into that violet by stages of bluish green and blue, etc. This whole difference seems to me to rest merely in the fact that we no longer regard colors as signs for the nature of objects, but merely as various sensations; and we therefore comprehend their peculiar differences the more accurately and uninfluenced by other considerations." A very interesting additional fact is presented¹ at the close of a very profound discussion of this subject of binocular apprehension of relief. He says: "Even looking at the landscape with one eye there is still some little difference when one looks first erect and then under his arm, which seems to me to be due to the fact that the upper part of the retina is weary of green and the lower of the blue of the sky; hence the colors become somewhat more vivid when they fall on new portions of the retina."

It thus appears that there was a germ of truth in the explanations offered by each of those who hazarded suggestions, and even in some too readily discarded theories. But our great authority, omitting nothing, has a word to say even with regard to those who were compelled, by the testimony of their own senses, to doubt the facts. Mark how generously he ratifies the apology we offered for their creditable scepticism! Speaking of another matter, he says:² "I have never been able to see this illusion very plainly myself, as,

¹ *Handbuch der Physiologischen Optik*, p. 727.

² *Ibid.*, p. 625.

indeed, there are many such illusions which, from the habit of greater attention to the phenomena of vision, disappear of themselves, *because the observer learns to make himself independent of disturbing influences.*"

Crow's Nest Mountain.

BY W. WHITMAN BAILEY.

Read November 14, 1883.

THE mountain, or rather hill, which bears the name of Crow's Nest, is, with perhaps one exception, the highest of the Hudson Highlands. The exception is Bull Hill, or, as those of classical tastes prefer to call it, Mt. Taurus. These peaks or crests stand like twin giants, guarding the northern entrance to the Highlands. The first is on the West Point side of the Hudson. The second rises abruptly and even precipitously behind the little village of Cold Spring. Here, at Undercliff, was the home of the poet G. P. Morris; beyond Crow's Nest, and on the same side of the river, is Storm King.

As portions of the general Appalachian chain, a connecting link between the mountains of Pennsylvania and the Berkshire and Green Mountains, the Highlands are of especial interest to our Club. We cannot, indeed, now think of a region so accessible, which at the same time would so well repay a visit, including, as it would, either a trip through Western Massachusetts or a sail upon the unequalled Hudson.

It is a curious fact that while West Point is annually thronged with visitors, very few have climbed Crow's Nest. Still more remarkable is the apathy of residents and cadets. We have known men pass through the four years' course at the Military Academy in ignorance of the grand features of the surrounding mountains. The ascent of Mt. Independence, crowned by the ruins of old Fort Putnam, is sufficient to exhaust most tourists. The much loftier Catskills are, in-

deed, more familiar to the crowds who yearly sail by the base of Crow's Nest.

From his earliest childhood the writer has known and loved this wild mountain ; it has been his inspiration, indeed, in the admiration of other ranges. To this day he turns to it with the eager yearning of a Swiss for his Alps. It was a salient feature in the home landscape. In late autumn it gave us the first indication of approaching winter ; for its summit would often be clothed with snow several weeks before it lay in the valleys. This cloak might melt away by noon, but it gave the old hills a decidedly Alpine appearance. The steepness of the Highlands, indeed, lends them a rugged, bold character, which higher elevations often lack,—it is no easy matter to ascend some of them.

There are various ways of approaching Crow's Nest from West Point. Latterly a very fine and carefully engineered road has been built, partly by the Government and partly by Orange County, which leads from the village of Highland Falls through the romantic Eagle Valley, and thence over the crest of Crow's Nest to Newburgh. At one of the highest points the trees have been cut away from the roadside to allow an outlook upon the plain of West Point and the beautiful Hudson. The heavy mountain showers necessitate frequent repairs upon this road. A branch highway, leading by the so-called Public Meadows, connects it with West Point ; the junction is at Swift's Falls, in the season of flood a most superb cataract ; here I used to go first for the *Erythronium* and the *Sanguinaria*, so that these two charming wild-flowers are associated in my mind with the splash of mountain waters. Niagara probably never more impressed an adult with its grandeur than did this rushing mass of foam my young imagination. The actual mountain-climber and seeker after the picturesque will not be satisfied with a carriage road ; he will leave this some distance beyond the soldier's village of Rugertown. I always knew the proper point at which to diverge, by a tremendous boulder, mossy and fern-covered, laved by a mountain stream. Under the shelter of this rock I have passed many a happy hour, looking over botanical collections or withal refreshing the inner man. Decidedly one of the

wildest ascents of Crow's Nest is by this ravine, called "*The Ravine*" *par excellence*. My father, who was a perfect guide to all this Highland region, took peculiar delight in this brawling torrent, whose varying moods he loved to study; he bestowed fanciful names upon certain points, as the "Fairies' Banqueting-Table," a mossy rock in mid-stream; the "Undinchen," a diminutive branch of the main cataract; the "Kissing-Bridge," etc. The origin of the last title savors somewhat of romance. It is a peculiarly difficult passage high up the ravine, over and between slippery rocks: here the ladies mostly needed, or at least requested, assistance; but a rigorous toll was always exacted, with much consequent fun and jolly laughter. "The Ravine" is, indeed, a rather formidable climb; the rocks, "at random thrown," are covered with wet moss and ferns, and the way is obstructed by windfalls; the footing is treacherous, and the mosquitoes legion.

There are few lovelier spots in America. It may be remembered that Drake lays the scene of his enchanting poem, "The Culpit Fay," near Crow's Nest, I have always thought, in this precise locality:—

"The moon looks down on old Cro' Nest;
 She mellows the shades on his shaggy breast,
 And seems his huge gray form to throw
 In a silver cone on the wave below.
 His sides are broken by spots of shade,
 By the walnut bough and the cedar made,
 And through their clustering branches dark
 Glimmers and dies the fire-flies' spark,
 Like starry twinkles that momentarily break
 Through the rifts of the gathering tempest's rack.
 The stars are on the moving stream,
 And fling, as its ripples gently flow,
 A burnished length of wavy beam,
 In an eel-like, spiral line below.
 The winds are whist, and the owl is still;
 The bat in the shelvy rock is hid;
 And nought is heard on the lonely hill
 But the cricket's chirp, and the answer shrill
 Of the gauze-winged katydid."

Drake's fancy peopled the vicinity with fays, good and bad; and even now these "tricksy" creatures can be seen by

the eye of faith. The trail up the ravine repeatedly crosses the brook, and finally disappears altogether; thenceforward the scramble is a hard one for the novice. Here, in the proper season, grows the *Orchis spectabilis*; the beautiful *Mitella diphylla* also shows its tiny flowers, like snow-flakes set on a stem. Here one can find the curious wild ginger (*Asarum*), and the yellow lady's-slipper (*Cypripedium pubescens*). Hepaticas, in early spring, troop in merry fashion over the whole slope of the mountain, together with yellow violets, the delicate rue-anemone, and the little wood anemone. A plant from "The Ravine" always seemed to me more beautiful than from any other known spot; it is where I always went for the rarest things, such, for instance, as the mountain-fringe (*Adlumia*). The stream, at times of exceptional dryness, almost disappears, but after a heavy rain is a torrent, the noise of which can be distinctly heard on the plain of West Point. I remember, as a child, thinking the sound especially solemn when heard in the night; I never tried the ascent in one of these times of flood. Lower down, this same stream forms the well-known "Cascade," which used to be much frequented by visitors; it is a very charming waterfall at all seasons, and in winter, when frozen, is something superb.

My last ascent of Crow's Nest, though I have visited "The Ravine" within two years, was on June 24, 1879, in company with a cadet of the then First, or Senior, Class. We used the old path up the face of the mountain, and near the old "wood-slide." Above the first summit we lost the path, which appeared to run up a tree. We wandered too far north, near where for many years an old beggar-woman had her small shanty. This old Tamer, who lived wholly on beggary, and brought up her children to the same honest calling, would have been a character for Scott. She used to make the ascent in the severest winter weather, when it would appear perilous to the most skilled climbers. There is to me something romantic in the establishment of any creature in so out-of-the-way a place. She must have grown contemplative, to say the least.

We made our way back through an impenetrable tangle of

scrub-oak, in an almost tropical heat. The actual summit, 1,394 feet above sea-level, is marked by a cairn of the Coast Survey, which used to be surmounted by one of their tin cones on a staff. Here and there we found bluebells (*Campanula rotundifolia*), as on Mt. Willard and other ridges of the White Mountains. Indeed, a good many of the flowers suggest that region; while again we may almost anywhere, on exposed cliffs in the Highlands, alight on the prickly-pear (*Opuntia*), with its wealth of lemon-yellow flowers. I never saw this on Crow's Nest; but it is common nearer the river, all along the West Point shore.

On the summit the view is unobstructed in every direction. One surveys all the beautiful wooded heights, — Storm King, Bull Hill, Break-neck, Bear Hill, Sugar Loaf, the Dunderberg, and Anthony's Nose. Beyond the Highland Range, to the south, expands the Bay of Haverstraw, marked by its three Tors of trap-rock, which we once climbed at the peril of life and limb. To the north, the river can be traced for at least thirty miles, or till it loses itself in the sky. To the east, there are lovely hills and dales, in part cultivated, sloping away to Connecticut. To the west can be seen the noble Shawangunk mountains, and the fertile valleys of the interior. The Catskills are outlined in blue to the north. Surely no prophet or seer ever looked down upon a promised land of rarer beauty!

It was extremely warm upon the summit, and our need of water was too urgent to allow a return by the same path. Knowing that the Newburgh road must be somewhere west of us, we concluded to seek it. After much slipping over rocks and tearing through shrubbery, — the latter of a mixed, but quite northern character, — we at length struck the highway. By this time we were almost desperate for water. There was positively none on the ascent. Dr. George Thurber speaks feelingly of what he once suffered from thirst on this mountain, in company with my father. A lucky shower coming up, they saturated their handkerchiefs, and then squeezed out a few tantalizing drops. Our fortune was better. We soon reached a rivulet, where we made due obeisance to the naiads. No nectar could have been more welcome.

Indeed, the vaunted drink of the gods is poor stuff at any time, as compared with a good mountain spring.

Fern-lovers would delight in these hills, where many choice specimens may be found; among them, the walking-fern (*Camptosorus rhizophyllus*). At this time the air was perfumed with the blossoms of the wild grape, the very perfection of fragrance. For music we had the rich flute-like notes of the wood-thrush, which always remind me of the delicious strains in the overture to "William Tell." Nothing seemed stranger to us in 1882, in Franconia, after just leaving West Point, than the appalling silence and birdless condition of the woods. On the Hudson in June and July every twig seems to have its singing bird.

The shape of Crow's Nest, as viewed from the plain of West Point, is that of an immense whale. From the piazza of the hotel the "nest" can be seen; it is a deep wooded valley between the first and second summits. The jutting bosses or promontories of precipitous rock, which buttress the old mountain, have been named, it is said, by my father, Wizard's Cliff and Eagle Cliff, respectively. The last is no imaginative title; one sometimes sees an eagle wheel about its giddy height. The new West Shore Railroad, which has done much to disfigure the Hudson, has not spared Crow's Nest. It passes by its base, and has obliterated Washington's Valley, a natural cove that lay between the Academy cemetery and Hitchcock's Point. We have spoken of the better known ravine. There is a northern and much bolder one through the rugged face of Crow's Nest opposite Cold Spring. My father used to refer to it as a very hazardous climb. I have myself never attempted it. For botanical purposes I should commend May as the very best month for a visit. Later, I have found the Highland flora rather meagre. At any time in spring or summer the heat is apt to be terrific; hence October would be preferable for the ascent. At that time, too, one gains the added charm of the superb autumnal coloring.

On the Principal Coefficients in the Barometric Formula of Laplace, as applied to the White Mountain Region.

BY JOHN TATLOCK, JR.

Read February 14, 1883.

IN a previous paper, "On the Variation of Barometrical Measurements of Altitudes with the Season," it was shown that several series of barometrical observations, when computed to determine the altitude of Mt. Washington, N. H., gave results which, in the mean, when compared with the true altitude of the mountain as determined by the spirit-level, were uniformly too high. From this it seemed fair to draw the inference that the principal constants in the barometric formula might be so modified as to reduce, in some degree at least, the discrepancy between the results given by the spirit-level and the barometer. To this end it seemed advisable to attempt to deduce empirical values of the pressure and temperature coefficients, taking as data the known altitude of the mountain and the observations which had been used to compute its barometric altitude. Inasmuch as previous investigations of this kind have not resulted in any essential modifications of the formula, it was not expected that results of much practical value would be reached in this discussion; but it was undertaken rather more with a desire to see what the results would be, and with a faint hope that they might contribute something to the explanation of the anomalies that have been noticed in connection with barometric work in the region of the White Mountains.

The observations used in this discussion are given in detail in the paper above mentioned. They are derived from the various reports of the Chief Signal Officer, U. S. A., and consist of meteorological observations taken on the summit of Mt. Washington, and at Portland, Me., Boston, Mass., and Burlington, Vt. In the preceding paper they were arranged for use in six series. The same arrangement has been followed here, and is as follows: Taking in turn Portland, Boston, and Burlington, as lower stations to compare with Mt. Washington as upper station, we have two series

of observations belonging to Mt. Washington and each of the above-mentioned stations; — the first consists of the mean monthly values of the pressure and temperature from July, 1878, to June, 1879, both inclusive; the second consists of the normal monthly values of the pressure and temperature for the six years 1873–78.

In order to deduce the values of the coefficients sought for, it is necessary to substitute the observations and difference of altitude between the two stations, as determined by the spirit-level, in the barometric formula, and, considering the constants as the unknown quantities, to form as many equations as may be necessary, and solve them. In this investigation each series of observations gave twelve equations, which were solved by the method of least squares, as will be seen further on.

By following the method just indicated, each equation will be of the following form: —

$$x \log \frac{H}{h} \left(1 + \frac{t + t' - 64.0}{y} \right) + c = L,$$

where H and h are the readings of the barometer at the lower and upper stations, respectively,

t and t' are the readings of the thermometer at the lower and upper stations, respectively,

c is the sum of the small terms of the formula,

L is the level difference of altitude, and

x and y are the unknown quantities.

But as the solution of the equations in this form involves the manipulation of inconveniently large quantities, it is preferable to assume approximate values of the unknown quantities, and find corrections to these values in the following manner: —

Let x = the pressure coefficient,

\bar{y} = the temperature coefficient = also y' ,

x° = approximate value of x = 60158.⁶,₆,

y'° = approximate value of $\frac{1}{y}$ = 0.001111,

dx = correction to x° ,

dy' = correction to y'° ;

then $x^\circ + dx = x$, and $y'^\circ + dy' = y'$.

Also let $\theta = t + t' - 64.0$,

and $n = L - c$,

and we shall have

$$x \log \frac{H}{h} (1 + y'\theta) = n, \quad (1)$$

$$\text{and also} \quad x^\circ \log \frac{H}{h} (1 + y'^\circ\theta) = n^\circ, \quad (2)$$

From (1) we find

$$\log \frac{H}{h} (x^\circ + dx) (1 + \theta y'^\circ + \theta dy') = n, \quad (3)$$

and by performing the operations indicated,

$$\log \frac{H}{h} [x^\circ (1 + y'^\circ\theta) + dx (1 + y'^\circ\theta) + x^\circ dy'\theta + dx dy'\theta] = n.$$

$$\text{But (2)} \quad x^\circ \log \frac{H}{h} (1 + y'^\circ\theta) = n^\circ;$$

hence, neglecting $dx dy'\theta$ and putting $n - n^\circ = n'$,

we have

$$\log \frac{H}{h} [dx (1 + y'^\circ\theta) + x^\circ \theta dy'] - n' = 0, \quad (4)$$

in which form the equations can be more easily handled.

Possibly to some it may appear rather absurd to apply the refinements of the method of least squares to a discussion of this kind, where only approximate results can be expected, from the very nature of the material; but in justification it may be said that this method of discussion was adopted, not so much in the expectation that more accurate results would be obtained by its use, but merely as the most convenient way of conducting the investigation.

In the following pages I have given, (1) the original equations formed from each series of observations, and which I have designated by the name of "observation" equations; (2) the equations of condition consisting of the "observation" equations transposed into the differential form, according to formula (4); and (3) the normal equations followed by the values of dx and dy' obtained from them.

The coefficients of dy' in the equations of condition were divided by 10,000 for convenience, and consequently the given value of dy' is its value deduced from the normal equations and divided by 10,000.

No attempt has been made to determine the probable errors of dx and dy' , as they probably would not represent anything definite, nor serve as any criterion for the combination of the individual values of dx and dy' . For this latter purpose I have assigned arbitrary weights, as will be seen further on.

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Observation Equations.

$$\begin{aligned}
x \log \frac{29.844}{23.865} \left(1 + \frac{71.6 + 50.4 - 64.0}{y} \right) + 18.^{\text{h}}0 &= 6240.^{\text{m}}2 \\
x \log \frac{29.830}{23.815} \left(1 + \frac{66.4 + 47.0 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{30.104}{23.974} \left(1 + \frac{62.0 + 43.5 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.928}{23.272} \left(1 + \frac{54.0 + 33.3 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.833}{23.433} \left(1 + \frac{40.0 + 17.1 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.827}{23.272} \left(1 + \frac{30.5 + 6.5 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.830}{23.243} \left(1 + \frac{24.2 + 2.1 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.913}{23.288} \left(1 + \frac{24.9 - 0.7 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{30.015}{23.505} \left(1 + \frac{34.0 + 13. - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.778}{23.416} \left(1 + \frac{42.6 + 17.5 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.962}{23.819} \left(1 + \frac{57.7 + 37.5 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.868}{23.773} \left(1 + \frac{61.8 + 42.8 - 64.0}{y} \right) + 18.0 &= 6240.2
\end{aligned}$$

Equations of Condition.

$.10336 \, dx + 338801.1 \, dy' - 4.7 = 0$	$+ 2.2$
$.10317 \, dx + 290645.4 \, dy' - 15.5 = 0$	$- 13.1$
$.10346 \, dx + 247456.0 \, dy' + 0.6 = 0$	$- 0.9$
$.10335 \, dx + 141206.7 \, dy' - 4.7 = 0$	$- 16.0$
$.10407 \, dx - 43500.9 \, dy' + 38.6 = 0$	$+ 10.1$
$.10454 \, dx - 175048.9 \, dy' + 66.9 = 0$	$+ 26.2$
$.10382 \, dx - 245758.2 \, dy' + 23.4 = 0$	$- 23.6$
$.10392 \, dx - 260333.6 \, dy' + 29.5 = 0$	$- 19.0$
$.10426 \, dx - 104118.5 \, dy' + 49.8 = 0$	$+ 15.7$
$.10393 \, dx - 244894.8 \, dy' + 30.3 = 0$	$- 16.7$
$.10310 \, dx + 187037.9 \, dy' - 19.4 = 0$	$- 26.5$
$.10358 \, dx + 242118.9 \, dy' + 9.7 = 0$	$+ 7.6$

Normal Equations.

$$\begin{aligned}
.129 \, dx + 3.79 \, dy' + 21.34 &= 0 \\
3.79 \, dx + 6054.77 \, dy' - 4231.90 &= 0 \\
dx = -189.^{\text{h}}3 & \quad dy' = +0.000082
\end{aligned}$$

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Observation Equations.

$$\begin{aligned}
x \log \frac{30.006}{23.393} \left(1 + \frac{22.6 + 5.7 - 64.0}{y} \right) + 18.^{\text{ft}}0 &= 6240.^{\text{ft}}2 \\
x \log \frac{29.929}{23.367} \left(1 + \frac{25.7 + 6.5 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.887}{23.379} \left(1 + \frac{33.2 + 12.8 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.874}{23.542} \left(1 + \frac{42.4 + 21.6 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.897}{23.702} \left(1 + \frac{53.9 + 32.1 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.901}{23.831} \left(1 + \frac{63.3 + 44.2 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.900}{23.894} \left(1 + \frac{69.1 + 48.3 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.949}{23.921} \left(1 + \frac{67.0 + 47.1 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{30.003}{23.867} \left(1 + \frac{60.0 + 40.1 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.947}{23.691} \left(1 + \frac{49.9 + 29.8 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.945}{23.503} \left(1 + \frac{37.5 + 16.3 - 64.0}{y} \right) + 18.0 &= 6240.2 \\
x \log \frac{29.942}{23.404} \left(1 + \frac{27.9 + 8.7 - 64.0}{y} \right) + 18.0 &= 6240.2
\end{aligned}$$

Equations of Condition.

	<i>v</i>
.10383 $dx - 232205.2 \, dy' + 23.9 = 0$	- 22.0
.10369 $dx - 205633.0 \, dy' + 15.7 = 0$	- 27.7
.10453 $dx - 115497.3 \, dy' + 43.5 = 0$	+ 8.2
.10345 $dx + 1.2 = 0$	- 23.2
.10325 $dx + 133399.2 \, dy' - 7.5 = 0$	- 19.6
.10331 $dx + 257895.3 \, dy' - 7.6 = 0$	- 8.3
.10316 $dx + 312830.0 \, dy' - 16.3 = 0$	- 11.9
.10304 $dx + 294191.2 \, dy' - 23.7 = 0$	- 21.0
.10326 $dx + 215804.3 \, dy' - 4.6 = 0$	- 9.1
.10355 $dx + 98120.7 \, dy' + 6.5 = 0$	- 9.1
.10402 $dx - 64400.2 \, dy' + 35.1 = 0$	+ 4.6
.10373 $dx - 176356.5 \, dy' + 18.3 = 0$	- 22.4

Normal Equations.

$$\begin{aligned}
.129 \, dx + 5.27 \, dy' + 5.40 &= 0 \\
5.27 \, dx + 4693.18 \, dy' - 3469.02 &= 0 \\
dx = -75.^{\text{m}}6 &\quad dy' = +0.000082
\end{aligned}$$

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Observation Equations.

$$\begin{aligned}
x \log \frac{29.773}{23.865} \left(1 + \frac{72.4 + 50.4 - 64.0}{y} \right) + 17.^{\text{ft}}7 &= 6143.^{\text{ft}}4 \\
x \log \frac{29.756}{23.815} \left(1 + \frac{68.1 + 47.0 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{30.009}{23.974} \left(1 + \frac{62.9 + 43.5 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.850}{23.732} \left(1 + \frac{55.3 + 33.3 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.763}{23.433} \left(1 + \frac{39.9 + 17.1 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.768}{23.272} \left(1 + \frac{29.6 + 6.5 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.768}{23.243} \left(1 + \frac{24.5 + 2.1 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.838}{23.288} \left(1 + \frac{24.5 + 0.7 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.927}{23.506} \left(1 + \frac{33.8 + 13.7 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.707}{23.416} \left(1 + \frac{42.4 + 17.5 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.897}{23.819} \left(1 + \frac{59.4 + 37.5 - 64.0}{y} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.790}{23.773} \left(1 + \frac{64.2 + 42.8 - 64.0}{y} \right) + 17.7 &= 6143.4
\end{aligned}$$

Equations of Condition.

	<i>v</i>
.10233 <i>dx</i> + 339795.4 <i>dy'</i> + 30.7 = 0	+ 37.8
.10432 <i>dx</i> + 303475.4 <i>dy'</i> + 23.5 = 0	+ 26.7
.10211 <i>dx</i> + 248746.6 <i>dy'</i> + 16.0 = 0	+ 14.8
.10222 <i>dx</i> + 147350.0 <i>dy'</i> + 30.2 = 0	+ 19.6
.10466 <i>dx</i> + 43833.1 <i>dy'</i> + 73.5 = 0	+ 52.8
.10360 <i>dx</i> - 179440.0 <i>dy'</i> + 106.8 = 0	+ 65.8
.10299 <i>dx</i> - 241777.6 <i>dy'</i> + 70.5 = 0	+ 24.0
.10283 <i>dx</i> - 260313.9 <i>dy'</i> + 60.2 = 0	+ 12.0
.10299 <i>dx</i> - 104135.4 <i>dy'</i> + 69.7 = 0	+ 35.8
.10290 <i>dx</i> - 25491.3 <i>dy'</i> + 63.4 = 0	+ 46.8
.10172 <i>dx</i> + 195368.6 <i>dy'</i> + 30.2 = 0	+ 24.2
.10267 <i>dx</i> + 253482.5 <i>dy'</i> + 50.2 = 0	+ 49.2

Normal Equations.

$$\begin{aligned}
.127 \, dx + 7.37 \, dy' + 64.45 &= 0 \\
7.37 \, dx + 5653.97 \, dy' - 1291.52 &= 0 \\
dx &= -563.^{\text{ft}}4 \qquad dy' = +0.000096
\end{aligned}$$

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Observation Equations.

$$\begin{aligned}
x \log \frac{29.925}{23.393} \left(1 + \frac{26.9 + 5.7}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.843}{23.367} \left(1 + \frac{28.5 + 6.5}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.798}{23.399} \left(1 + \frac{34.8 + 12.8}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.772}{23.542} \left(1 + \frac{43.4 + 21.6}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.806}{23.702} \left(1 + \frac{55.7 + 32.1}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.813}{23.831} \left(1 + \frac{66.3 + 44.2}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.816}{23.894} \left(1 + \frac{72.0 + 48.3}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.843}{23.921} \left(1 + \frac{69.1 + 47.1}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.906}{23.867} \left(1 + \frac{61.7 + 40.1}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.864}{23.691} \left(1 + \frac{51.7 + 29.8}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.864}{23.503} \left(1 + \frac{39.0 + 16.3}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4 \\
x \log \frac{29.863}{23.404} \left(1 + \frac{30.4 + 8.7}{y} \frac{64.0}{-} \right) + 17.7 &= 6143.4
\end{aligned}$$

Equations of Condition.

	<i>v</i>
.10322 $dx - 202026.3 \, dy' + 83.5 = 0$	+ 40.5
.10282 $dx - 185346.2 \, dy' + 59.5 = 0$	+ 18.1
.10308 $dx - 103583.4 \, dy' + 75.3 = 0$	+ 41.4
.10209 $dx + 6134.9 \, dy' + 15.0 = 0$	- 8.5
.10214 $dx + 142475.9 \, dy' + 19.3 = 0$	+ 8.3
.10230 $dx + 272106.2 \, dy' + 27.4 = 0$	+ 28.3
.10217 $dx + 325687.1 \, dy' + 21.5 = 0$	+ 27.4
.10162 $dx + 301077.3 \, dy' - 12.0 = 0$	- 8.3
.10204 $dx + 222692.3 \, dy' + 15.1 = 0$	+ 11.5
.10236 $dx + 105699.1 \, dy' + 32.6 = 0$	+ 18.1
.10302 $dx - 54447.2 \, dy' + 72.2 = 0$	+ 42.9
.10292 $dx - 158886.7 \, dy' + 66.4 = 0$	+ 27.5

Normal Equations.

$$\begin{aligned}
.126 \, dx + 6.85 \, dy' + 48.93 &= 0 \\
6.85 \, dx + 4657.85 \, dy' - 2968.60 &= 0 \\
dx &= -459.77 \qquad dy' = +0.000131
\end{aligned}$$

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Observation Equations.

$$x \log \frac{29.654}{23.865} \left(1 + \frac{73.2 + 50.4 - 64.0}{y}\right) + 17.3 = 6044.5$$

$$x \log \frac{29.611}{23.815} \left(1 + \frac{69.2 + 47.0 - 64.0}{y}\right) + 17.3 = 6044.5$$

$$x \log \frac{29.879}{23.974} \left(1 + \frac{63.2 + 43.5 - 64.0}{y}\right) + 17.3 = 6044.5$$

$$x \log \frac{29.741}{23.732} \left(1 + \frac{53.1 + 33.3 - 64.0}{y}\right) + 17.3 = 6044.5$$

$$x \log \frac{29.675}{23.433} \left(1 + \frac{37.4 + 17.1 - 64.0}{y}\right) + 17.3 = 6044.5$$

Omitted.¹

$$x \log \frac{29.654}{23.243} \left(1 + \frac{16.6 + 2.1 - 64.0}{y}\right) + 17.2 = 6017.6$$

$$x \log \frac{29.722}{23.288} \left(1 + \frac{16.1 - 0.7 - 64.0}{y}\right) + 17.2 = 6017.6$$

$$x \log \frac{29.764}{23.505} \left(1 + \frac{28.4 + 13.7 - 64.0}{y}\right) + 17.2 = 6017.6$$

$$x \log \frac{29.585}{23.416} \left(1 + \frac{39.7 + 17.5 - 64.0}{y}\right) + 17.2 = 6017.6$$

$$x \log \frac{29.717}{23.819} \left(1 + \frac{61.1 + 37.5 - 64.0}{y}\right) + 17.2 = 6017.6$$

$$x \log \frac{29.612}{23.773} \left(1 + \frac{62.8 + 42.8 - 64.0}{y}\right) + 17.2 = 6017.6$$

Equations of Condition.

.10057 $dx + 338179.7 dy' + 22.8 = 0$	+ 30.1
.10010 $dx + 297094.8 dy' - 5.9 = 0$	- 2.3
.10017 $dx + 245651.6 dy' - 5.6 = 0$	- 6.2
.10046 $dx + 132087.0 dy' + 16.3 = 0$	+ 4.8
.10148 $dx - 58613.7 dy' - 22.0 = 0$	+ 51.4
.10046 $dx - 288389.5 dy' + 43.8 = 0$	- 6.4
.10023 $dx - 309766.8 dy' + 28.9 = 0$	- 23.9
.10009 $dx - 135159.5 dy' + 18.1 = 0$	- 18.0
.10079 $dx - 41260.0 dy' + 63.4 = 0$	+ 25.4
.09978 $dx + 200010.0 dy' + 2.6 = 0$	- 2.6
.09982 $dx + 238772.8 dy' + 3.0 = 0$	+ 1.4

Normal Equations.

$$.111 dx + 6.18 dy' + 15.60 = 0$$

$$6.18 dx + 5439.46 dy' - 2265.72 = 0$$

$$dx = -174.58$$

$$dy' = +0.000061$$

¹ The position of the barometer was changed during December, 1878.

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Observation Equations.

$$\begin{aligned}
x \log \frac{29.813}{23.393} \left(1 + \frac{19.4 + 5.7 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.755}{23.367} \left(1 + \frac{21.1 + 6.5 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.693}{23.399} \left(1 + \frac{29.7 + 12.8 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.685}{23.542} \left(1 + \frac{41.9 + 21.6 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.692}{23.752} \left(1 + \frac{55.2 + 32.1 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.676}{23.831} \left(1 + \frac{67.1 + 44.2 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.687}{23.894} \left(1 + \frac{71.4 + 48.3 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.736}{23.921} \left(1 + \frac{69.4 + 47.1 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.788}{23.867} \left(1 + \frac{60.1 + 40.1 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.746}{23.691} \left(1 + \frac{49.0 + 29.8 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.763}{23.503} \left(1 + \frac{34.8 + 16.3 - 64.0}{y}\right) + 17.3 &= 6044.5 \\
x \log \frac{29.754}{23.404} \left(1 + \frac{24.2 + 8.7 - 64.0}{y}\right) + 17.3 &= 6044.5
\end{aligned}$$

Equations of Condition.

	<i>v</i>
.10077 $dx - 246466.6 \, dy' + 36.1 = 0$	- 10.4
.10052 $dx - 229838.5 \, dy' + 31.6 = 0$	- 13.3
.10099 $dx - 133816.2 \, dy' + 47.0 = 0$	+ 10.8
.10063 $dx - 3028.7 \, dy' + 27.1 = 0$	+ 3.0
.10038 $dx + 137155.8 \, dy' + 12.0 = 0$	+ 0.9
.10027 $dx + 271124.6 \, dy' + 4.7 = 0$	+ 5.9
.10011 $dx + 315916.6 \, dy' - 3.6 = 0$	+ 1.8
.10001 $dx + 298461.9 \, dy' - 10.6 = 0$	- 6.8
.10011 $dx + 209585.8 \, dy' - 5.7 = 0$	- 10.1
.10047 $dx + 88001.9 \, dy' + 17.3 = 0$	+ 1.7
.10109 $dx - 79501.2 \, dy' + 54.2 = 0$	+ 23.0
.10060 $dx - 195063.2 \, dy' + 28.8 = 0$	- 13.0

Normal Equations.

$$\begin{aligned}
.121 \, dx + 4.28 \, dy' + 24.09 &= 0 \\
4.28 \, dx + 5087.29 \, dy' - 3425.55 &= 0 \\
dx = - 229.88 & \qquad dy' = + 0.000087
\end{aligned}$$

In combining the individual values of dx and dy' , I assigned to each value a weight depending, in a general way, upon the duration of the series of observations from which that particular value was deduced. In the case of the values resulting from the Boston observations, I also took into account the fact that Boston is at a greater distance from Mt. Washington than Portland or Burlington.

In the following table are collected the individual values of dx and dy' , with the weights assigned them:—

dx	dy'	Weight.
— 189. ⁸³	+ 0.000082	1
75.6	0.000082	6
563.4	0.000096	$\frac{3}{2}$
459.7	0.000131	4
174.8	0.000061	1
— 229.8	+ 0.000087	6

Hence, taking the mean by weights, we have,

$$dx = -236.⁸³ \text{ and } dy' = + 0.000092$$

$$\text{whence } x = 59922.⁸³ \text{ and } y' = 0.001203$$

The barometric formula of Laplace, with the foregoing modifications, will then read as follows, omitting the small terms:—

$$Z = \log \frac{H}{h} 59922.⁸³ \left(1 + \frac{t + t' - 64.⁰⁰$$

The question now presents itself, How do these results satisfy the observations? In the column headed v , on the right of the several series of equations of condition, I have given the residuals found from substituting in those equations the *final adopted* values of dx and dy' . In this position they can be readily compared with the residuals found by the use of the coefficients of Laplace, which residuals are of course the absolute terms of the equations of condition with their signs changed. By an inspection of these residuals, it will be seen that the new coefficients give residuals which in general are less than the original residuals; but the only place where this difference is strikingly exhibited is “Mt. Washington and Burlington, Second Series,” where the individual values of dx

and dy' approximate very nearly to the values finally adopted. There is such a wide range in the individual values of dx and dy' that the foregoing result would naturally be expected.

In the following table I have given a comparison of the sums of the *squares* of the *residuals* as found by the coefficients of Laplace, and by the new coefficients : —

	<i>Portland.</i>		<i>Boston.</i>		<i>Burlington.</i>	
	I.	II.	I.	II.	I.	II.
Laplace,	11536.75	5283.09	40375.29	28849.66	8452.24	11635.45
New,	3427.06	3580.97	17060.57	8500.07	5224.79	1298.69

From this it might reasonably be inferred that the new coefficients have a decided superiority to those of Laplace for use in the region of the White Mountains; but it is now necessary to consider the uncertainties by which the results which we have reached are affected. First and foremost of these is, of course, the well-known fact that all barometric work and all results depending upon it are affected by errors whose causes are not understood; then in the particular cases which we have been investigating, the level difference of altitude of the stations has been arrived at by very indirect methods, in which there is abundant opportunity for errors to accumulate; and to the above is to be added the fact that our results depend upon observations extending over a comparatively short period of time. In view of all these facts, we can hardly say that the barometric formula deduced above is to be recommended in place of the old formula, although it appears to present some advantages; and the results which we have reached must be considered of interest solely on account of their strangeness and novelty.

But as the deduced coefficients differ so widely from any that have been proposed, we may accept this fact as another striking illustration that there is abundant opportunity for investigation on this subject in the White Mountain region.

A comparison of the observed mean temperature of the intervening stratum of air between two barometric stations, with that deduced from the formula by making the mean temperature the unknown quantity, has been found in other cases to furnish fruitful results, and I hope at some future

time to present to the Club some investigations in this direction.

If any of the members of the Club should feel disposed and should have any opportunity to use the foregoing formula and compare it with the old, I should be gratified to be made acquainted with the results.

If the formula, on trial, should be found to present any advantages, I should take the first opportunity to construct from it a table for the use of the Club.

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RECENT CONTRIBUTIONS TO BAROMETRIC HYPSONOMETRY.

A NEW METHOD OF MEASURING HEIGHTS BY MEANS OF THE BAROMETER.

By G. K. GILBERT. Extract from the Annual Report of the Director of the U. S. Geological Survey, 1880-81.

As is well known to all who have paid any attention to the subject of Barometric Hypsonometry, the greatest obstacle to the accurate determination of altitude by means of the barometer, is the fact that as yet no satisfactory method has been devised for ascertaining the temperature of the intervening stratum of air between the two places whose difference of altitude is required. A knowledge of this factor is, however, of the utmost importance, as the correction which depends upon it amounts, in most cases, to a quantity which is a very considerable proportion of the whole altitude.

In the paper under consideration, Mr. Gilbert has devised a method, not for ascertaining with great accuracy the temperature of the air column, but one which seeks to eliminate as far as possible the effect of this undetermined temperature. Whether the method reaches the much desired result can only be ascertained by long-continued experiments; but it certainly promises well, and it may fairly be said that the results already obtained compare very favorably with those reached by the older methods. The principle on which it rests is simply this: the barometric determination of the difference of altitude between two places by means of a synchronous barometric measurement of the difference between two places whose true difference of height is already known. Mr. Gilbert's method proposes a new system, both of observation and of computation. In the older methods the thermometer is the invariable companion of the barometer. In this the barometer alone is used. The scheme of observation is briefly as follows: two stations are selected as distant as possible from each other vertically, and as near as possible horizontally, and their difference of altitude is determined by the spirit-level. These are called the base stations. Frequent observations of the barometer alone are made at both stations, and also at a third station whose altitude is required. A simultaneous observation at all three stations constitutes the basis for the computation of the altitude of the third stations. The method of computation is as follows: the approximate differences of altitude between the base stations and between the lower base station and the station whose altitude is desired are computed in the ordinary manner, on the assumption that the column of air is dry, and at a uniform temperature of 32° Fah. These approximate altitudes then give the following propor-

tions: the approximate height of the base line is to its true height as the approximate height of the third station is to its true height; hence the true height of the third station becomes known. It will be readily seen that the essential principle of this process is the assumption that the condition of one air column is identical with the simultaneous condition of the other with respect to the standard of density. In practice the computation is put into a more convenient form, and a correction is applied which depends upon the principle that the density of a column of air is not uniform, but is a function of the length of the column. Here Mr. Gilbert's method becomes empirical. The expression for this correction contains a constant which is supposed to depend for its value upon the law of the variation of temperature and moisture in a given column of air. Of course, almost nothing is known with certainty in regard to this law, and the value of the constant used is deduced from series of observations of temperature made at stations whose difference of altitude is known. Mr. Gilbert does not regard this value as final, but simply as the best at present attainable.

The author has compared results obtained by the use of his method with those obtained by other investigators. There is not space to go into the details of these comparisons; suffice it to say, that *in general* the discrepancies between heights determined by the level and those by the barometer are, by Mr. Gilbert's method, considerably reduced.

The author does not claim for his method that it is of universal application, but points out that it is particularly adapted for use on the surveys of the western part of this continent. His chapter in which he discusses the circumstances in which the barometer can or cannot be used advantageously, is of peculiar interest and value. It would be unjust to Mr. Gilbert not to make mention of the exceedingly lucid explanation which he has given — as he says, for the benefit of the general reader — of the general theory of barometric hypsometry, and the errors to which its application is liable. His discussion of the barometric gradient, not only in hypsometric researches, but also as regards meteorology in general, is well worth attention.

As Mr. Gilbert himself points out, the principle of his method has been used by previous investigators, notably Ruhlmann; but no one before him has put it into a really practical and practicable form.

METEOROLOGICAL RESEARCHES. By WILLIAM FERREL. Part III. Barometric Hypsometry and Reduction of the Barometer to Sea-Level. Appendix No. 10. Report of the Superintendent of the U. S. Coast and Geodetic Survey for 1881.

Starting with the fundamental principles of the mechanics of the atmosphere, Professor Ferrel has developed a theory of barometric hypsometry, which, in point of completeness, leaves but little for future investigators in this direction to perform. The theory follows, as a matter of course, as the author says, from the results of the investigations embodied in Parts I. and II. of the Meteorological Researches. All the factors, such as friction and the rotation of the earth, have been carefully analyzed and their effects calculated. The final expression is put into about the same form as that of Laplace, but the adopted constants are quite different from any that have ever been used before. The effect of the barometric gradient is emphasized throughout the paper, a point upon which Professor Ferrel is probably as well qualified to speak as any living meteorologist.

A very complete set of tables for the application of the theory accompanies the paper. It is to be hoped that an extended comparison may be made, in order to test the efficiency of these tables. The text contains some inquiries into the nature of a few of the anomalies that continually arise to provoke the hypsometer, and an interesting section on "The Reduction of the Barometer to Sea-Level." Altogether, this may be considered the most important contribution to the subject that has appeared in some time.

TAVOLE-PRONTUARIO DA 1 A 5,000 METRI PER LA MISURA DELLE ALTEZZE COL MEZZO DEL BAROMETRO. Saggio di F. SALINO. Belluno, 1883.

The method for determining heights by means of the barometer, detailed in this paper, is certainly the simplest and most comprehensive one that has been proposed since the days of Tobias Mayer. The tables are so arranged that, entering them with a simple argument depending, of course, upon the barometer readings, the difference of altitude is at once given, with but a small correction to be applied.

Contrary to the usual belief, Signor Salino does not hold that the improvement in methods of barometric hypsometry is to be produced by a new method of ascertaining the temperature of the air column, or by new coefficients for the temperature term; the basis of his new theory is the effect of the variation of gravity upon the barometric column, depending upon its distance from the centre of the earth, and also depending upon the distance of the earth from the sun. The correction for this variation of gravity also includes the effect of the difference of the mean temperature of the air, depending upon the radius vector of the earth. To say the very least, this theory is ingenious, and the examples which Signor Salino has given of the comparison of his theory with observation show, undoubtedly, that there is something in it; but is it not fair to expect that, in the climate of Italy, equable, comparatively free from great atmospheric disturbances, and consequently free from large barometric gradients, theoretical corrections depending upon a mean state of the atmosphere would accord well with observation, while in localities like the Appalachian range, for instance, the effect of these corrections would be totally masked by the large errors caused by the irregular variations of the condition of the atmosphere?

We cannot think that Signor Salino is altogether correct, however, in ascribing to the variation of gravity such effects as he supposes it to produce. Most investigators on this subject have come to the conclusion that a term depending on this can safely be neglected.

The author applies his theory to the problem of the reduction of the barometer to the sea-level, and in this connection his term, which is a function of the radius vector of the earth, has undoubtedly a good deal of significance; for a satisfactory value of this reduction for any given place depends upon the mean state of the atmosphere at that place, and Signor Salino's theory supplies as comprehensive an expression for this average condition as has ever been devised.

J. T., JR.

Report of the Recording Secretary for 1883.

GREAT prosperity has attended the Club during the past year.

Acting upon the excellent advice of my predecessor, I undertook the laborious task of preparing a new register of membership. The book contains the names of all persons who have ever been connected with the Club, and shows to what class of membership each one belongs, — whether honor-

ary, corresponding, life, or annual,—the address of each, and the date of acceptance, death, resignation, or forfeiture of membership; it shows also in what department of the Club's work each member is particularly interested; and, finally, what members of the voluntary association did not become members of the corporation. The names are arranged under the different letters of the alphabet, but those under each letter are arranged chronologically. The completion of this work suggests a general review of the membership of the Club since its formation in February, 1876. I therefore ask your attention to the appended tables.

TABLE I.

MEMBERSHIP PREVIOUS TO INCORPORATION.

Original members, Feb. 9, 1876	39	
Additions during 1876	90	
“ “ 1877	64	
“ “ 1878 (before March 13)	6	
Total membership when incorporated	199	

Of these 199 members of the voluntary association, 150 (75 per cent) became members of the corporate body, while 49 withdrew; and 95 (48 per cent) were members Jan. 1, 1884.

TABLE II.

MEMBERSHIP SINCE INCORPORATION.

January 1, 1879	164		
Net gain “	71	43 per cent.	
January 1, 1880	235		
Net gain “	85	36 “ “	
January 1, 1881	320		
Net gain “	101	32 “ “	
January 1, 1882	421		
Net gain “	67	16 “ “	
January 1, 1883	488		
Net gain “	91	19 “ “	
January 1, 1884	579		

TABLE III.

TOTAL MEMBERSHIP, EXCLUSIVE OF HONORARY AND CORRESPONDING MEMBERS.

Corporate membership, Jan. 1, 1884	579
Resignations from Feb. 9, 1876, to Jan. 1, 1884	115
Withdrew at incorporation of the Club	49
Forfeited memberships	39
Deaths	8
Total loss since organization of the Club ¹	211
Total of all enrolled as corporate members since organization	790

TABLE IV.

TOTAL MEMBERSHIP, INCLUSIVE OF HONORARY AND CORRESPONDING MEMBERS.

Honorary Members, Jan. 1, 1883	9
" " added in 1883	1
" " Jan. 1, 1884	10
Corresponding Members, Jan 1, 1883	37
" " added in 1883	2
" " lost "	2
" " Jan. 1, 1884	37
Present total of non-corporate members	47
Deceased since organization of the Club	4
Grand total of non-corporate members	51
" " corporate members	790
Total of all enrolled in the Club since its organization .	841

Mr. John G. Whittier has been added to the list of Honorary Members, making 10 on Jan. 1, 1884. Mr. R. H. Budden, of Florence, and Señor Don Ramon Arabía y Solanas, of Barcelona, have been made Corresponding Members. This gain of two has been counteracted by a loss of two,—General A. A.

¹ This is 26 per cent of 790, the whole number of persons at any time connected with the Club, exclusive of Honorary and Corresponding Members.

Humphreys having died in December, and Mr. J. G. Whittier having been made an Honorary Member; the number of Corresponding Members, therefore, remains 37.

During the year there were 47 resignations and 1 death, and 4 memberships were forfeited, making a total loss of 52. There were added to the Club 143 new members, so that the net gain is 91. Of these new members, 82 (57 per cent) were gentlemen and 61 (43 per cent) were ladies.

The total corporate membership, Jan. 1, 1884, was 579, of whom 19 were life members, against 13 in the preceding year. The total membership, including Honorary and Corresponding Members, was 626.

During the year there have been held 9 regular, 2 special, and 2 field meetings,—13 in all; the average attendance, about 80, has been unusually large, and six of the meetings were attended by from 100 to 150 persons.

At these 13 meetings there were presented 38 papers and 7 Reports of Councillors,—a total of 46, not including Reports of Secretaries and Committees. Of the 38 papers, 7 were illustrated with the lantern; 22 treated of some section of the White Mountains, five being devoted to the Twin Mountain Range. That the work of the Club was not confined to the White Mountains is proved by the fact that papers were presented relating to the following wide range of localities: Traveller Mountain, in Maine; the Adirondacks; Crow's Nest, on the Hudson; the Jungfrau; the Route Salvan; the Mountains around Zermatt; Norway; Palestine; Hawaii; Jamaica; and Greenland.

Successful excursions were made to Middlesex Fells; Greenfield, N. H.; the Catskills; and to Sutton and Milton, Mass. In connection with the field meetings many excursions were made, including a trip over the Twin Mountain Range and ascents of Cherry Mountain and Mts. Crawford and Chocorua.¹

The annual reception was held at the Vendome, January 31, and was much enjoyed by the large number present.

Vol. III. No. 2. of APPALACHIA was issued in April, and No. 3, dated December, 1883, is now ready for distribution.

¹ See APPALACHIA, Vol. III. p. 292.

REPORT OF THE CORRESPONDING SECRETARY. 367

Again we have occasion to renew our most hearty thanks to the Massachusetts Institute of Technology and to the Boston Society of Natural History for the great privileges they continue to extend to the Club.

Respectfully submitted,

ROSEWELL B. LAWRENCE,

Recording Secretary.

Report of the Corresponding Secretary for 1883.

DURING the past year the correspondence of this Secretaryship has been for the greater part with foreign societies, and very largely with reference to the library of the Club. Just previous to the last year's report letters were sent to various societies whose publications we possessed in part, with the view to securing, by the promise of reciprocal action, the donation of back numbers of their publications. The offer was suggestive of good will on our part rather than of an expectation of giving fair compensation in kind, considering that some of these bodies had been in existence for many years before our Club was organized, and moreover had published voluminously. In consideration of these facts the response must be considered very flattering to us, and indicative of a genuine fraternal interest in our Society, which indeed has, in some instances, been manifested in express terms in the letters which announce the granting of our request. These generous societies are the Deutscher und Oesterreichischer Alpenverein, the Norske Turistforening, the Oesterreichischer Touristen Club, the Associació d' Excursions Catalana, the Verein für Erdkunde in Leipzig, the Société de Géographie Commerciale de Bordeaux, and at home, the Cambridge Entomological Club. Other societies have responded partially. The number of volumes contributed to our library by this means will appear in the list of accessions printed with this report.

A year ago the library numbered about 280 volumes and 130 pamphlets,—something over 400 in all. There have been added during the past year some 90 volumes and 30 pamphlets,—or about 120 numbers altogether, making the

total at present more than 525 volumes. The additions of the past year have been almost entirely in the way of exchange with other societies, only 3 bound volumes and 20 pamphlets being acquired from other sources. Of these the more important are from their authors, who are at the same time members of the Club. During the year some 50 volumes have been solidly and elegantly bound, not only beautifying the alcove which the Natural History Society kindly places at our disposal in its library, but also greatly economizing the space at our disposal.

As might be foreseen, the number of persons availing themselves of a library of special literature, chiefly in foreign languages, is not large,—the duties of the librarian in charge being rather in the direction of cataloguing than of facilitating circulation. The suggestion of a club system of circulation made in the preceding report has been tested to some extent during the past year, six persons having expressed their wish to see certain publications as they are received. The Secretary in charge of the library will suggest to the Council, in view of the year's experience, a few rules regarding the length of time for which books may be kept, and the requirement of a small annual fee, just sufficient to cover postage and compensate the Natural History Society for the time of the assistant librarian who has the oversight of the matter.

Four societies have been added to the list of corresponding bodies during the past year: the central section of the Club Alpin Français and of the Club Alpin Suisse, and the Società degli Alpinisti Tridentini have accepted the proposition made by this Club to enter into relations of correspondence and interchange of publications, and a similar proposition from the Società degli Alpinisti Triestini has been accepted by us.

Several circulars have been received from foreign clubs, either conveying information of matters of special interest in their fields of work, or else invitations to the members of this Club to participate in their congresses or festivals. It is a matter of much regret, that, owing to a failure to receive his correspondence in due time, Professor E. C. Pickering, whom the Club appointed to represent its interests during his last summer's visit to Europe, was unable to be present at any of

these pleasant and profitable reunions. Invitations of the sort were received from the Deutscher und Oesterreichischer Alpenverein, the Club Alpin Suisse, the Società degli Alpinisti Triestini, to attend their congresses; and from the Società Alpina Friulana, the Vicenza and Verona sections of the Club Alpino Italiano, and the Società degli Alpinisti Tridentini, to attend their Alpine festivals. A circular from the Directory of the Club Alpino Italiano announces an Alpine Exhibition at Turin in 1884,—an exposition not only of the inventions called into existence by the development of alpinism, and the works of literature and art that have attended it, but also of the industries of the humble dwellers in the mountain districts, which certain of the clubs make it their beneficent duty to foster and encourage. This Club has been invited to contribute, and also to send representatives to the Congress that will be held at the same time.

Of the letters received from correspondents in our own land two merit renewed mention in this report, as manifesting the way in which our work is regarded in distant parts of the country. Gentlemen in Tennessee and New Mexico have been interested to correspond with regard to our organization and methods, in the hope that they might be instrumental in establishing similar societies in those regions. It is greatly to be desired that their endeavors may be successful, inasmuch as the remoteness of those fields renders it beyond the power of a club located in New England to contribute much to their development; while in point of interest, both as regards their remarkable topographical features and the comparatively small degree to which they have been explored and reported upon, they far exceed the circumscribed region to which hitherto the energies of our members have been directed.

The following is a list of the publications received from various sources during the past year:—

FROM CORRESPONDING SOCIETIES.

American.

- American Museum of Natural History.* — Annual Report; Bulletin.
Cambridge Entomological Society. — *Psyche*, Vol. IV. Nos. 105-114.
Essex Institute. — Bulletin, Vol. XIV. Nos. 7-12.

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Geological and Natural History Survey of Minnesota. — Historical Sketch of Explorations and Surveys in Minnesota.

New York State Survey. — Annual Report.

Torrey Botanical Club. — Bulletin, Vol. X.

United States Department of War. — Annual Report of Chief of Engineers, 1882, Parts I.-III.; Report of the Chief Signal Officer.

United States Geological Survey. — Tertiary History of the Grand Cañon District, with Atlas; Second Annual Report; Bulletin, No. 1; Mineral Resources of the United States.

United States Geological Survey of the Territories. — Twelfth Annual Report.

United States Lake Survey. — Primary Triangulation.

Foreign.

Alpenclub "Oesterreich." Oesterreichische Alpen-Zeitung, 1882, Nos. 79-104.

Associació d' Excursions Catalana. — Butlletí, Any IV. 51-59; Opiniones Emesas sobre lo primer Anuari.

Club Alpin Français. — (*Direction Centrale*) Bulletin, Vol. XVIII. Nos. 11-13. (*Section du Sud-Ouest*) Bulletin, 1883, Janvier.

Club Alpino Italiano. — (*Direzione Centrale*) Bollettino, Nos. XLV.-XLIX.; Rivista, Vol. I. 12, Vol. II. 1-10; Bollettino Decadico, Vol. XI. 10-12, Vol. XII. 1-7. (*Sezione di Vicenza*) Bollettino, Anno VI.; Guida Alpina di Recoaro; Le Industrie alpine e la Sezione di Vicenza; Il Dento di Gigante. (*Sezione Fiorentina*) Resoconto dell' Adunanza Generale, 1883; La Piscicoltura in Montagna.

Club Alpin Suisse. — (*Comité Central*) Jahrbuch, Bd. XVIII. mit Beilagen; Itinéraire pour 1882-84. (*Sections Romandes*) L'Echo des Alpes, Vol. XVIII. 4, Vol. XIX. 1-3.

Deutscher und Oesterreichischer Alpenverein. — (*Central Ausschuss*) Zeitschrift, Bde. VI.-X., Bd. XII. 1-3, Bd. XIII. 1; Beilage, 1878-81; Mittheilungen, Bde. I.-V., Bd. VII. 3-6, Bd. VIII. 10, Bd. IX. 1-6, 8-9; Nachtrag zum Mitglieder Verzeichniss, etc., 1879. (*Section Küstenland*) Jahresbericht, 1882.

Den Norske Turistforening. — Årbog, 1868-1874, 1882.

Oesterreichischer Touristen-Club. — Oest. Touristen Zeitung, Bd. I. 1-8, 10, 12, Bd. II. 1-9, 14, 21, 22, Bd. III. 2-22; Jahresbericht, I., II.; Jahrbuch, IV.-IX., XI.; Chronik, 1882, Bd. II. 2-6.

Siebenbürgischer Karpathenverein. — Jahrbuch, III.

Società Alpina Friulana. — Cronaca, 1882.

Società degli Alpinisti Tridentini. — Annuario, 1881-82; La Valle di Rendena.

Gesellschaft für Erdkunde (Berlin). — Verhandlungen, Bd. IX. 5-10, Bd. X. 1-7.

Imp. Ryss. Geog. Obshtchestvo. — Izvestiya, Tom. XVIII 3, 4, Tom. XIX. 1, 2; Otchet, 1882.

- Kais-kön. Geographische Gesellschaft.* — Mittheilungen, Bd. XXV.
Royal Geographical Society. — Proceedings, Vol. V. 2, 3, 5-11.
Sociedade de Geographia (Lisbon). — Bolletim, 3 Ser. A, 5-12, 4 Ser. A;
 Expedição Scientifica à Serra da Estrella em 1881; La Question du
 Zaire; Les Institutions de Prévoyance du Portugal; A Questão do
 Meridiano Universal; Direitos de Padroado di Portugal em Africa.
Société de Géographie Commerciale. — Bulletin, Vol. X. 2 Ser. 1-5, 7-12,
 14-22.
Société Royale de Géographie d'Anvers. — Bulletin, Vol. VII. 5-7, VIII.
 1-2; Mémoires, Vol. II.
Société Khédiviale de Géographie. — Bulletin, Vol. II. 3, 4.
Verein für Erdkunde zu Leipzig. — Mittheilungen, 1872-79, 1882.

FROM EXCHANGES.

- Deutsche Touristen-Zeitung*, Nos.
 1-9.
Revue Géographique Internationale,
 Nos. 56, 57, 63, 64, 71, 72, 87-95.
The Scientific Roll, Vol. I. 2, 10.
Outing, Vol. I., Vol. II. 1-8.
White Mountain Echo, 1881-82.
Among the Clouds, Vol. VII. (in-
 complete).

FROM AUTHORS.

- The Heart of the White Mountains.*
 S. A. Drake.
Guide to Bristol and Newfound
Lake. H. Murdock.
Lake Agassiz: a Chapter in Glacial
Geology. W. Upham.
Good Company Magazine (with ar-
ticles on "The Land of the Mid-
night Sun," by Lieutenant F.
Schwatka).
Rambles in the Tropics: Jamaica.
 W. C. Bates.

- Topographical Section in Williams-
 town. (MS.) S. H. Scudder.
Handbuch des Alpenen Sport. J.
 Meurer.
New State Map of North Carolina.
 W. C. Kerr.

FROM OTHER SOURCES.

- Meteorology of Mt. Washington.*
Tabelle zur Bestimmung der in
Deutschland wild wachsenden
Holzgewächses.
Ascomycetes Lojkani lecti in Hun-
garia, Transsylvania, et Gallicia.
Der Volkswirth, 1883, No. 29.
Der Tourist, Bd. XV. Nos. 8, 9.
Organ des Gebirgsvereins für die
sächsische-böhmische Schweiz,
Jahrgang, 1883, No. 1.
The Kaaterskill, Vol. II. No. 14.
Science, Vol. I. No. 17.
Register of the Newton Natural
History Society.
Appalachia, Vol. III. No. 2.

Respectfully submitted,

CHARLES E. FAY,

Corresponding Secretary.

Treasurer's Report for 1883.

THE receipts for the year ending Dec. 31, 1883, were as follows: —

From balance cash on hand Dec. 31, 1882 . . .		\$502.00
“ admission fees of 141 members —		
28 members at \$2.00 each . . .	\$56.00	
113 members at \$3.00 each . . .	339.00	\$395.00
“ assessments —		
333 members for 1883	\$999.00	
balance due from 1 member for 1883 . . .	1.00	
2 members for 1881	4.00	
8 “ “ 1882	16.00	
8 “ “ 1884	24.00	
1 “ “ 1885	3.00	1047.00
“ seven payments for Life-Memberships of E. W. Hoyt, Rev. Theo. F. Wright, W. S. Fenollosa, Rosewell B. Lawrence, Louis Prang, Elizur Wright, and Gardiner H. Scudder		210.00
“ APPALACHIA, sales of copies		197.58
“ Donations —		
From Miss Ellen J. Baker	\$12.00	
(\$7.00 of which to be expended in clearing a path to top of Humphrey's Ledge, N. Conway)		
“ a lady friend of New York	10.00	22.00
“ balance returned by the Committee on Annual Reception and Entertainment		27.00
“ balance returned by the Committee on Field Meetings and Excursions		82.88
“ interest on cash loaned		39.72
	<u>\$2021.18</u>	2021.18
		<u>\$2523.18</u>

The payments for the year were as follows: —

Paid for postage and stationery	\$190.18	
“ for printing and advertising	199.55	
“ for clerical services	67.41	
“ for Appalachia —		
800 copies, Vol. III. No. 2	\$321.49	
Other expenses, including postage	44.78	366.27
“ Suffolk Savings Bank, deposited to credit of Permanent Fund		281.72
“ Department of Topography —		
Expenses for the summer of 1883	23.65	\$1128.78

TREASURER'S REPORT.

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Amount brought forward	\$1128.78	
Paid Department of Improvements —		
Paid for clearing Mt. Adams and King's Ravine Path, building camp, and other expenses	\$38.27	
Less donations for above —		
From Mrs. Hollingsworth	\$5.00	
" John Ritchie, Jr.	2.00	
" E. E. Norton	2.00	9.00 \$29.27
" for signs for Mt. Washington and Paths		5.00
" Allen Thompson on account of work on Twin Mountain Path ¹	\$36.00	
Less donation from Mr. M. Addey	5.00	31.00
" for expense of extension of Twin Moun- tain Path		50.00
" for work on Bridal Veil Falls Path		5.00
" for record bottles		8.50
" Miss M. J. Stone, to be expended for improvements near N. Woodstock, N. H.		10.00
" for clearing Carter Notch Path		8.00
" for labor on Carter Dome		5.00
" for stencils, etc.		1.60
" Dr. W. B. Parker, to be expended in clearing path to top of Humphrey's Ledge	7.00	160.37
" Library		69.78
" from balance received from the Com. on Annual Reception and Entertainment		17.28
" from balance received from the Com. on Field Meetings and Excursions	1.38	\$1377.59
Balance of cash on hand		<u>1145.59</u>
		<u>\$2523.18</u>

¹ As some of the receipts and expenses on account of the Twin Mountain Path do not appear in above statement, only a part having passed through the Treasurer's hands, the following is appended:—

Received from Prof. E. C. Pickering	\$5.00	
" " Dr. John H. Dix	5.00	
" " Mr. Markinfield Addey	5.00	
" " Proprietor Twin Mountain House	50.00	
" " receipts of Excursion Committee	20.00	
" " A. M. C., Treasurer	71.00	\$156.00
Paid Allen Thompson, as per contract to South Twin	\$75.00	
" William N. Sargent for completing path	81.00	\$156.00

The undersigned have examined the accounts of Charles W. Kennard, Treasurer of the Appalachian Mountain Club, for the year 1883, and find them properly kept and correctly balanced, with satisfactory vouchers for all payments. The assets of the club are:—

Permanent Fund in Suffolk Savings Bank¹ . . . \$641.72

Cash in hands of Treasurer 1145.59

(Signed) A. E. SCOTT,
EUGENE B. HAGAR,
WILBUR B. PARKER.

STATEMENT OF RECEIPTS FOR FIRST EIGHT YEARS.

YEAR.	MEMBERSHIPS.					Sales of Appalachia.	Interest.	Donations.	Life-Memberships.	Annual Reception.	Field Meetings and Excursions.	Total.
	Admission Fees.	Yearly Assessments.	Back Assessments.	Advance Assessments.	Total.							
1876	252.00	..	..	..	252.00	43.00	....	....	....	....	....	296.00
1877	52.00	248.00	12.00	....	812.00	98.00	....	....	....	....	....	410.00
1878	75.00	226.00	16.00	....	318.00	76.09	....	43.00	60.00	....	....	497.00
1879	148.00	290.00	40.00	....	448.00	130.00	2.00	222.00	....	....	....	802.00
1880	178.00	336.00	24.00	....	538.00	117.00	11.00	86.00	90.00	....	....	842.00
1881	222.00	384.00	18.00	12.00	636.00	141.00	17.59	62.55	120.00	....	....	977.04
1882	256.00	528.00	74.00	....	858.00	309.43	22.07	2.00	90.00	....	....	1281.50
1883	395.00	1000.00	20.00	27.00	1442.00	197.58	39.72	22.00	210.00	27.00	82.88	2021.18
Total	1577.00	2982.00	204.00	39.00	4804.00	1112.01	92.38	437.55	570.00	27.00	82.88	7125.72

STATEMENT OF EXPENDITURES FOR FIRST EIGHT YEARS.

YEAR.	Permanent Fund.	Postage, Stationery, &c.	Miscellaneous Printing.	Appalachia.	Topographical Department.	Art Department.	Improvements & Exploration.	Clerical Expenses.	Field-Meeting Expenses.	Annual Reception.	Library.	Total.
1876	....	* 36.00	74.00	141.00	....	....	15.00	....	..	....	....	266.00
1877	....	39.00	84.00	155.00	....	13.00	....	....	....	....	....	500.00
1878	....	84.00	161.00	200.00	2.00	53.00	20.00	....	....	....	....	520.00
1879	60.00	65.00	96.00	240.00	13.00	....	159.00	....	....	....	....	612.00
1880	90.00	77.00	109.00	290.00	19.00	....	73.00	....	....	....	....	686.00
1881	120.00	139.22	194.87	246.23	37.95	....	2.00	19.75	22.70	....	....	908.72
1882	90.00	143.59	115.40	675.93	25.40	....	....	34.50	25.00 ¹	....	....	1109.82
1883	281.72	190.18	199.55	396.27	23.05	....	160.37	67.41	1.38	17.28	69.78	1377.59
Total	641.72	834.99	1033.82	2523.43	127.00	66.00	436.37	123.66	49.08	17.28	69.78	5980.13

¹ Expense of Delegate to Milan.

Respectfully submitted,

CHAS. W. KENNARD, *Treasurer.*

¹ The Permanent Fund consists of \$570, being from nineteen life members, at \$30 each; and the sum of \$71.72 received for interest, making the sum of \$641.72 deposited in the Suffolk Savings Bank at this date.

Proceedings of the Club.

April 11, 1883. — Forty-seventh Corporate Meeting.

President Worcester in the chair.

Twelve candidates for membership were nominated, and the ten presented at the last meeting were all elected.

The Corresponding Secretary presented the letters received since the last meeting. These included a letter from the Società degli Alpinisti Tridentini, giving notice of the transfer of the seat of the society for the ensuing two years from Trento to Rovereto, and containing the list of officers for the same period; a letter from the Comité Central of the Club Alpin Suisse, accepting proposal for change of publications; and a letter from the Central Ausschuss of the Deutscher und Oesterreichischer Alpenverein, containing a favorable response to the request for back numbers of its publications.

On motion of the Corresponding Secretary, a vote of thanks was passed to the Deutscher und Oesterreichischer Alpenverein and the Oesterreichischer Touristen Club as an expression of the Club's appreciation of their great kindness in sending it full sets of their publications.

President Worcester gave a general description of the scenery of Palestine, illustrated by a map and photographs. The hill country from Hebron to Mt. Ebal was described as a broad mountain range, averaging about three thousand feet in height. The views from the hills of Judæa are fine, especially looking over the Dead Sea and the Jordan valley to the purple eastern mountains. The finest view among the central mountains is that from Mt. Ebal, which includes some seventy miles of sea-coast, over the plains of Philistia and Sharon; and to the north the plain of Esdraelon, the mountains of Galilee, and both Lebanon and Hermon; and the long range of eastern mountains, which lie near enough to show every ravine distinctly. The views from Carmel and Tabor were described; also Mt. Hermon, and the great springs supplied by its snow fields. A marked element in the scenery was said to be the pure color, — the deep red of the earth, the warm tints of the rocks in many places, the brilliant scarlet, yellow, and blue of the flowers; all which, together with the fresh green of the spring wheat fields and the deep blue of the sky, give constant surprises of beauty.

The Recording Secretary then read a letter written Sept. 24, 1817, by Alden Partridge, Captain of Engineers, stationed at Governor's Island, N. Y., and addressed to the Hon. Samuel L. Mitchell, on the "Altitude of Ascutney Mountain in Vermont and Moose-Hillock in New Hamp-

shire." This letter was furnished by Mr. C. W. Folsom, being copied by him from the "American Monthly Magazine and Critical Review," Vol. II. No. 1. The altitudes given by Captain Partridge were calculated by him from barometrical and thermometrical observations made during his vacation in August, 1817. Though as fully informed, perhaps, in such matters as any one of his time, he says that "Moose-Hillock is undoubtedly the highest mountain (except the White Mountains) in the Northern States, if not this side the Mississippi."

The Corresponding Secretary read a letter from Professor Griffin, of Williamstown, relating to the Alpine Club which was formed at Williamstown in 1863, and which made an excursion to the White Mountains in 1864 under the guidance of Mr. Samuel H. Scudder. Mr. Scudder then gave some pleasant reminiscences of his connection with this first American alpine society.

May 10, 1883. — Forty-eighth Corporate Meeting.

President Worcester in the chair.

Eleven candidates, including Mr. John G. Whittier for Honorary Membership, were presented, and those nominated at the last meeting were all elected.

The President explained the new rule adopted by the Council regarding nominations; which requires that a printed list containing the names of nominees and nominators be distributed at the meeting of the Club.

The Corresponding Secretary announced the acceptance of Corresponding Membership by Mr. R. H. Budden, of Florence, Italy; also the receipt of letters from the Società degli Alpinisti Triestini, announcing its formation, and from the Verein für Erdkunde zu Leipzig, accompanying a gift of its publications from 1872 to 1879 inclusive. He also read a letter from Professor W. G. Brown of Tennessee University, Knoxville, suggesting the formation in that region, and possibly to be affiliated with it, of a club similar in nature to the Appalachian Mountain Club. The President announced that the Council had appointed Professor Fay and Mr. A. E. Scott a committee to consider the questions raised by Professor Brown's letter.

Mr. Scott, the Chairman of the Excursion Committee, made a report upon the excursions which the Committee had under consideration.

A vote of the Council recommending to the Club the appointment of Professor E. C. Pickering as a delegate to represent the Club at any European Conference which might be held during the season of 1883, was read, and upon the motion of Colonel Folsom the recommendation was adopted.

The Rev. William C. Winslow read an interesting paper, entitled "Camp Life in the Adirondacks." The writer, who had spent twenty-five seasons among the mountains and lakes of the Adirondacks, set forth the various experiences usually met with in camp life. He described the

system of streams and lakes by which it is possible to travel one hundred and fifty miles with only a few short carries, and dwelt especially upon the attractions of the mud-lake section, — a part of the wilderness which is seldom visited. Then followed several incidents in the writer's experience in deer-hunting. In discussing the paper, Mr. Charles H. Ames expressed his regret that the present name of Mt. Marcy had supplanted the old Indian name Táhawus (cloud-splitter).

Mr. J. Rayner Edmands read a paper entitled "The White Mountains as seen from Jefferson Highlands," and illustrated by a profile of the Presidential Range thrown upon the screen. (See p. 203.)

Mr. John Ritchie, Jr., read a paper entitled "An Ascent of the Jungfrau." It was a narrative of a two days' trip by two Americans accompanied by two porters and two guides, and gave a vivid description of their experiences among the high Alps. Among the twenty illustrations thrown upon the screen were several fine views of the Jungfrau, those from Interlaken and the Eggischhorn deserving special mention; also views of the Lower Grindelwald, the Viescher and Aletsch glaciers; and views of many of the peaks of the Bernese Alps, including the Wetterhorn, Eiger, Mönch, and Finsteraarhorn. The route taken was that from Grindelwald, the party spending a few hours of the night in the hut of the Bergli, and arriving at the summit early in the morning.

June 13, 1883. — Forty-ninth Corporate Meeting.

President Worcester in the chair.

Eight candidates, including one for Corresponding Membership, were nominated, and those presented at the last meeting were all elected.

The Corresponding Secretary reported the receipt of an invitation from the Società Alpina Friulana to the inauguration of its campaign of 1883.

Professor C. E. Hamlin, the Councillor of Natural History, read a report suggesting work in the Ktaadn region. He stated that on account of the inaccessibility of the region little had been accomplished in the various branches of natural history, but that he hoped for better results in the near future, as a road and bridle path are now being opened which will take travellers as far as the Great Basin.

Mr. J. R. Edmands, the Councillor of Topography, made a report calling attention to the various kinds of aid which can be rendered by those members of the Club who have had no training in scientific work; showing that in hydrography, especially, much remained to be done, and that members of the Club could render the department valuable assistance by making notes of their explorations, by sketching ridges and streams, and by criticising and correcting existing maps.

President Worcester then read extracts from the report of Mr. E. B. Cook, the Councillor of Exploration. After enumerating various mountains which need exploration in the White Mountain region, Mr. Cook

suggested the desirability of exploring the streams on Jefferson, Monroe, Pleasant, and Clinton, the notches between Kinsman and Blue Ridge, Carter Dome and Black Mountain, Mts. Royce and Caribou, and between Caribou and Red Rock Mountains, and Bear Mountain. He suggested work in the Rangeley Lake region, and inquired why "Wassataquoik," said to be ten miles north of Ktaadn, had been ignored. (See p. 256.) Mr. Cook concluded his report by mentioning the instruments which are useful, and by emphasizing the desirability of making careful notes upon all exploring expeditions.

Mr. A. E. Scott made a few remarks on the new path to the North and South Twins, and the proposed extension to the Cliffs on Bond.

July 21, 1883. — Fifteenth Field Meeting.

Held at the Twin Mountain House, White Mountains.

Vice-President Scott in the chair. About one hundred members and friends were present.

Mr. Scott read a letter from President Worcester, expressing regret at not being able to attend the meeting, and offering the use of his study at Intervale for a meeting to be held later in the season.

The records of the last meeting and accounts of the Mountain Laurel Excursion and of the Hudson River and Catskill Excursion were read by the Recording Secretary.

Mr. J. Rayner Edmands, Councillor of Topography, described the topographical work which the department proposed to do on the Twin Mountain Range during this meeting, explained the assistance of which volunteers could be to the department, and invited any one who was willing to assist to report to him for special instructions.

A paper entitled "An Ascent of Mt. Garfield," written by Mr. Cook, the Councillor of Exploration, was read by Professor Fay. (See p. 275.)

Professor Hitchcock, before taking up his main subject, described the ice sheet which once covered the whole of this region, and the glaciers which moved down the different valleys from the summit of Mt. Washington, and made a few remarks concerning the geology of the Twin Mountain Range. His paper, "Hawaiian Volcanoes," was both instructive and entertaining. After a few words upon the general character of the Sandwich group, he described in detail the two great volcanoes of Hawaii, Kilauea and Mauna Loa.

Mr. W. G. Nowell read a paper entitled "Three Camps a Mile high," being reminiscences of experiences in camps on the Presidential Range above timber line.

Mr. Scott announced the various excursions which had been arranged by the committee.¹

¹ For an account of the excursions made in connection with the Field Meetings of 1883, see p. 294.

September 4, 1883. — Sixteenth Field Meeting.

Held at the Study of President Worcester, Intervale, White Mountains.

President Worcester in the chair. About one hundred members and friends were present.

The records of the July Field Meeting were read.

Mr. Edmands, the Councillor of Topography, gave an account of the topographical work which the department accomplished on the Twin Mountain Range in July; he described the general character of the whole range, and gave the principal features of its various divisions.

The President mentioned the map which the Department of Topography is preparing. He also expressed a hope that those members who take photographs among the mountains would contribute copies to the Club.

Mr. Scott announced the excursions which had been arranged by the committee.

A letter from Mrs. L. D. Pychowska was read by the President, in which an account was given of an exploration made by Mr. E. B. Cook and some friends over the Carter-Moriah Range. (See p. 299.)

President Worcester then read a paper by Mrs. and Miss Pychowska on Evans Notch and Mts. Royce and Baldface. (See p. 264.)

A humorous poem by Miss E. W. Cook entitled "How they carried the Tape from Bruin Rock to the Summit of Mt. Adams: A Ballad with a Burden" was read by Miss A. Fannie Alden.

Mr. James Schouler then read a carefully prepared paper entitled "Mountains as viewed by English Poets." He spoke of the effect the mountains have upon the imagination, and the influence they have had upon the literature of the world. His illustrations were chiefly taken from Shakspeare.

Professor Fay read a paper entitled "Optical Illusions among the Mountains," based upon an article by Dr. August Böhm in the *Zeitschrift of the Deutscher und Oesterreichischer Alpenverein*. (See p. 323.)

October 10, 1883. — Fiftieth Corporate Meeting.

President Worcester in the chair.

Fifty candidates for membership were presented, and eight new members were elected, including Señor Don Ramon Arabia y Solanas, of Barcelona, Spain, as a Corresponding Member.

The Corresponding Secretary reported several additions to the library, and also the receipt of invitations to the convention of the *Deutscher und Oesterreichischer Alpenverein* held in Passau; to that of the *Swiss Alpine Club* held in Berne; to that of the *Società degli Alpinisti Triestini* in Goritz; to a field meeting of the *Società Alpinisti Tridentini* at Predazzo; and to one of the *Vicenza Section of the Club Alpino Italiano* at Chiesanuova.

The Corresponding Secretary then mentioned the presence of two guests of the Club, — Captain Vives y Vich, of the Corps of Engineers of the Spanish Army, and Señor Torroja, the Spanish Vice-Consul, the former a member of the *Associació d' Excursions Catalana*, whose president had just been elected a Corresponding Member of the Club.

The President read an invitation to the Club from the Commissioner for the State of North Carolina, Mr. M. McGehee, to inspect the collection of minerals now on exhibition at the Manufacturers and Mechanics' Institute.

Mr. Selah Howell read a paper entitled "Route Salvan," an entertaining sketch of a trip over the Alps from the Lake of Geneva to the Valley of Chamounix.

Mr. W. L. Hooper read a paper entitled "A trip over Osceola, the Twin Mountain Range, and Garfield." (See p. 285.)

A paper by Mr. George H. Witherle, of Castine, Me., entitled "Exploration of the Traveller Mountain, and of the Head Waters of Mattagamgon River," was read by Professor C. E. Hamlin. (See p. 222.)

November 14, 1883. — Fifty-first Corporate Meeting.

President Worcester presided, about one hundred persons being present. The Recording Secretary being absent, J. Ritchie, Jr., was chosen Recording Secretary *pro tem*.

Eleven candidates for membership were presented; and those presented at the last meeting were all elected.

The report of Mr. E. B. Cook, Councillor of Exploration, was read by the Secretary. Dr. W. B. Parker, Councillor of Improvements, presented his report of work done during the year, including copious appendices by Messrs. Nowell and Cook. (See p. 288.)

Mr. A. E. Scott read a report of the work done on the Twin Mountain Path (see p. 290), being supplementary to the report of Dr. Parker.

Two papers — one on "Mt. Parker and Mt. Nancy," by Mr. Albert Matthews (see pp. 280-282), and the other, "A Visit to the Imp Face" (see p. 274), by Miss S. M. Barstow — were read by Miss Susan Hale.

Professor W. Whitman Bailey, of Providence, R. I., presented a paper on "Crow's Nest on the Hudson." (See p. 344.)

Mr. George A. Sargent described a summer's trip over Deception, Dartmouth, and Mitten. (See p. 278.)

A paper by Miss Edith W. Cook, entitled "Reconnaissance of the Carter Range" (see p. 299), was read by Professor Fay.

November 20, 1883 (Evening). — Special Meeting.

President Worcester in the chair.

About one hundred and twenty-five persons were present.

A paper entitled "Randolph," by Mrs. L. D. Pychowska, was read by the Recording Secretary. It gave a description of the points of interest

about Randolph, N. H., and an account of the comparatively unknown "Pond of Safety." (See p. 216.)

Mr. W. H. Pickering spoke upon "White Mountain Photography," and illustrated his remarks with a large number of photographs taken by him the past summer, and with several fine lantern views. He first exhibited his camera, and explained the process of developing plates and then gave an account of two trips over the Presidential Range, made for the purpose of securing views of the more interesting features, — the first by ascending through Tuckerman's Ravine and descending through King's Ravine; the second by ascending *via* the Crawford Path, and descending on the carriage road, with a *détour* to Huntington's Ravine. He also showed several excellent lantern views of North Conway scenery, some of the slides being loaned by Mr. C. P. Worcester.

Mr. C. H. Ames read a paper entitled "The Mountains near Zermatt." He first exhibited a map of Switzerland, and showed the relative position of the Bernese and Pennine Alps and the location of Zermatt, and then described the neighboring mountains, — illustrating his description with a large number of fine lantern views.

December 12, 1883. — Fifty-second Corporate Meeting.

Vice-President Scott in the chair.

There were seventy-five persons present. Seventeen candidates, including three for Corresponding Membership, were nominated; and those presented at the last meeting were all elected.

The Corresponding Secretary reported that there had been received for the library, since June, 39 complete volumes, and 93 parts of periodical publications.

It was voted that the President of the Club be requested to appoint a committee of three to nominate officers for the ensuing year. The President subsequently appointed Mr. R. F. Curtis, Professor C. R. Cross, and Dr. W. B. Parker.

It was voted that the Club hold a reception, as in previous years, and that the President be requested to appoint a committee with full powers to arrange for the same. The President subsequently appointed Professor C. E. Fay, Chairman. Mr. R. F. Curtis, Miss M. Talbot, and Miss M. C. Worcester were afterwards added to the Committee.

Mr. J. Rayner Edmonds, the Councillor of Topography, presented his autumn report. He mentioned the work done by Professor F. D. Allen in the Androscoggin valley, by Mr. W. G. Nowell on the Moose River, by Mr. E. D. Chamberlain in Eastern Massachusetts, his own work on the Twin Mountain Range, and the work done by himself and Professor Fay in the Willoughby Lake region, principally on Mt. Burke. On motion of Mr. Edmonds, it was voted that the matter of publishing a map of the White Mountain region on the scale of $\frac{1}{250,000}$ be referred to the existing Committee on Maps.

Professor W. H. Niles gave a very interesting account of Baron Nordenskjöld's Greenland Expedition, and summed up the results of this important expedition as follows : There is no range of mountains in the interior; the country rises in a gentle swell from the coast to the centre, reaching a height of 2,000 feet; the surface is covered by a confluent glacier; deposits of dust, terrestrial and cosmic, give support to plants; there are remains of habitations on the east coast built by the Norsemen; and, outside the cold ocean current which flows southerly close by the shore, there is a warm current flowing northerly, probably an extension of the Gulf Stream.

An entertaining paper on the Twin Mountain Range and Valley of the East Branch was read by Mr. R. K. Wood. This was an account of the trip made by the Club party last July. The interesting views from the mountain tops, and the beauties of the streams and the forest were described, and many pleasant incidents of the trip were mentioned.

Mr. Rosewell B. Lawrence then read an account of "An Ascent of the Giant's Stairs." (See p. 284.)

The hour being late, the following papers were not read, but were presented by title: "Ascents of Mts. Hale, Pliny, and Caribou," by Mr. E. B. Cook (see pp. 257, 261, 263), and "A Partial Exploration of Mt. Wildcat," by Miss M. M. Pychowska. (See p. 271.)

December 19, 1883 (Evening). — Special Meeting.

President Worcester in the chair.

Professor C. E. Fay read his paper entitled "Optical Illusions in the Mountains," which had undergone numerous changes since it was presented for the first time at the September Field Meeting at North Conway, new facts having been added, and corroboration of some of its positions having been found in the mean time. (See p. 323.)

January 9, 1884. — Fifty-third Corporate Meeting (Annual).

Vice-President Scott in the chair.

Seventy-five persons were present. Three candidates for membership were nominated; and those presented at the last meeting were all elected, including the following gentlemen as Corresponding Members: Dr. E. Behm, of Gotha, Germany; General Francis A. Walker, of Boston; Professor Edward S. Morse, of Salem, Mass.

The Corresponding Secretary reported the receipt, during the past month, of the following letters: from the Norske Turistforening, accompanying a donation of its publication (*Årbog*) from 1868 to 1874; from the Club Alpino Italiano, announcing an Alpine exhibition in Turin in August, 1884; and from General Hazen, Chief Signal Officer, U. S. A., asking for a set of *APPALACHIA* for the library of the Signal Office.

The Recording Secretary, Corresponding Secretary, and Treasurer then presented their annual reports. Upon motion of Professor W. H. Niles, these reports were accepted, and the thanks of the Club extended to the three officers for their services.

Mr. R. F. Curtis reported for the Committee appointed to nominate officers for the year 1884; and upon ballot the following officers were elected in accordance with the recommendation of the Committee: President, A. E. Scott; Vice-President, J. B. Henck, Jr.; Recording Secretary, Rosewell B. Lawrence; Corresponding Secretary, Charles E. Fay. Councillors: Natural History, Charles E. Hamlin; Topography, J. Rayner Edmands; Art, John Worcester; Exploration, E. B. Cook; Improvements, W. B. Parker. Mr. Scott, the presiding officer, announced the result of the election, and, in accepting the office of President, made a few remarks thanking the Club for the honor conferred.

The Club then listened to a paper by Mr. Elizur Wright on the "Sanitary Effect of Forests," — a strong appeal for the preservation of our forests. A few remarks were made by Professor Fay, urging the duty of members of the Club, so far as possible, to influence public opinion in favor of the project to set apart the Middlesex Fells as a forest park. Through the kindness of Mr. Wright there were distributed copies of a little pamphlet entitled "The Voice of a Tree from the Middlesex Fells."

Rev. W. C. Winslow read a paper entitled "Mt. Zion To-day."

January 18, 1884 (Evening). — Special Meeting.

President Scott in the chair.

About one hundred and fifty persons were present.

Mr. Fred A. Ober delivered a lecture on "Mexico," illustrating his remarks with a large number of lantern views. He mentioned the physical characteristics of the country, spoke of the people, cities, antiquities, etc., described the different zones of vegetation met with in ascending from the coast to the snow line on the mountains, and, what was of particular value and interest, gave an account of his ascent of Popocatepetl.

February 13, 1884. — Fifty-fourth Corporate Meeting.

President Scott in the chair.

Seventy-five persons were present. No nominations were presented, the printed lists not being ready. The candidates for corporate membership nominated at the last meeting were unanimously elected.

The Corresponding Secretary reported acceptances of Corresponding Membership from General F. A. Walker and Professor E. S. Morse, and the receipt from the Alpenclub "Oesterreich" of a Draft of Rules for International Alpine Congresses, to come before the Congress to be held in Turin in August of the present year. This communication was referred to the Council.

Professor E. C. Pickering presented to the Club, in the name of Professor George Davidson of the U. S. Coast and Geodetic Survey (a Corresponding Member of the Club), two fine photographs, — one representing the summit of Round Top in the Sierra Nevada Mountains, with the station of the Survey; the other the extended prospect westward from the peak, with a remarkable cloud effect. Two letters from Professor Davidson were also read, in one of which mention was made of sets of some forty-five views taken in connection with his work, and probably at the central office of the Coast and Geodetic Survey at Washington. The Corresponding Secretary was instructed to endeavor to procure a set of these photographs for the Club.

The Rev. Mr. Worcester exhibited some photographs presented to the Club by Mr. Gardiner H. Scudder, which were taken by him in Colorado in 1881.

The Recording Secretary announced the death of Professor Arnold Guyot, an Honorary Member of the Club, and moved that Professor W. H. Niles be appointed a committee to prepare suitable resolutions.

The Rev. A. H. Buell, D.D., of Asheville, N. C., being present, was invited to address the Club. He gave information concerning the leading attractions of the mountains of his State, and recommended the last of May and the first of June as the best season for visiting that region.

Mr. C. E. Ridler read a paper entitled "A Trip to Prince Edward Island and Blomidon."

Professor W. G. Farlow gave an account of some of the "Diseases and Deformities of Trees in the White Mountains," illustrating his remarks with illustrations. He spoke particularly of the black, or dwarf, spruce and its diseases, and made interesting comparisons with similar diseases found in Europe.

Mr. W. H. Pickering gave an account of a winter trip to Jefferson during last month, including a winter ascent of Mt. Adams; several photographs were exhibited.

February 20, 1884 (Evening). — Special Meeting, in Huntington Hall.

About three hundred and fifty persons were present. President Scott introduced the speaker of the evening, the Rev. John Worcester.

Mr. Worcester showed and described sixty-eight lantern slides, selected as illustrating the scenery of Sinai and Palestine. A general view from Mt. Serbal was first shown; then the Wady Feiran, the broad plain of Er Rahah, the cliffs of Ras Sufsafeh, the top of Jebel Mousa, and the picturesque masses of Jebel Katerina. It was stated that Jebel Katerina was a rugged block of porphyry, the other mountains in the neighborhood being granitic; and the effect of the rush of water down their bare cliffs, in the rainy season, was shown in the water-swept valleys at their base. The gorges of Petra, with some of the architectural tombs cut in their sides, were then exhibited; and after a few views of Hebron and Jeru-

saalem, the observer was taken to the Jordan, and shown the river, the intervalle, the soft limy cliffs which bound the lower levels, answering to the "meadow banks" of our New England intervalles, the broad plain of Jericho, and the mountains which constitute the western wall of the plain. The beautiful plain of Esdraelon was next presented, with the spring of Jalud, Mt. Tabor, and Nazareth; and then some pretty views of the plain of Magdala and the Sea of Galilee. The springs of Dan and Banias were shown, and the snow fields of Mt. Hermon, by which they are supplied. The orchards of Damascus were connected with the fine spring of El Fijeh and the Upper Barada River, which was shown in its wild passage through the range of Anti-Lebanon. A general view of Baalbek led on to the cedars of Lebanon, which were shown in general and in particular; and the evening closed with views of the Christian town of Zahleh, the broad valley of the Bekaa and Mt. Hermon, from the Lebanon pass, and the port of Beirut.

March 12, 1884. — Fifty-fifth Corporate Meeting.

President Scott in the chair.

Seventy persons were present. The nomination by the Council of Dr. T. Sterry Hunt, of Montreal, for Corresponding Membership was presented, and twenty-eight nominations for Corporate Membership.

Professor W. H. Niles, who was appointed a Committee at the last meeting to prepare suitable resolutions upon the death of Professor Guyot, after appropriate remarks, presented the following resolution, which was adopted by the Club:—

"Holding in high esteem the geographical labor of Professor Arnold Guyot, *be it Resolved*: That the Appalachian Mountain Club is impressed with the loss it is now called to sustain, in the death of an honored and illustrious member, and that the Club receives with gratitude that rich store of knowledge his researches have disclosed to those who seek the truths of nature among the Appalachian Mountains."

The Corresponding Secretary reported the receipt of: A proposal for interchange of publications from the Geographische Gesellschaft zu Greifswald (Pomerania); acceptance of a similar proposal from the Club by the Sociedad Geografica de Madrid; acceptance of Corresponding Membership by Dr. E. Behm, of Gotha, Germany; a communication from Mr. R. H. Budden, of Florence, Italy, Corresponding Member of the Club; an appeal from the Società degli Alpinisti Tridentini, soliciting contributions in behalf of the sufferers at Castello, an Alpine village entirely destroyed by fire on Jan. 31, 1884; and a notification of the change of name of the Alpenclub "Oesterreich" to the Oesterreichischer Alpine Club. It was voted that collections be taken up at this and the next meeting for the sufferers at Castello.

There were present at the meeting Mr. Henry Gannett, representing

the U. S. Geological Survey, and Mr. W. M. Davis. Upon request, Mr. Davis explained the proposition made by the Survey to the Massachusetts

- Legislature, for the joint production of a topographical map. Upon motion of Judge Robert C. Pitman, the subject was referred to the Council. After the papers for the day were presented, this motion was reconsidered, upon the motion of Rev. W. C. Winslow; and the subject was discussed by Professors E. C. Pickering, C. E. Fay, and others, and the following resolution, previously offered by Mr. J. R. Edmands, was passed: —

“*Resolved*, That the Appalachian Mountain Club, in view of the great insufficiency of existing maps of Massachusetts, recognize, in the proposal recently made to the Legislature by the U. S. Geological Survey, an opportunity to obtain a topographical map of the State, which should not be lost unless the Legislature is prepared to inaugurate a more thorough and expensive plan.”

The matter was also referred to the Council for further consideration.

The first paper, — read, in the absence of the author, by Mr. W. H. Ladd, — entitled “Mountain Adventures by Signor Alessandro di Placido, including a Winter Ascent of Fujiyama, Japan,” was prepared by Samuel Kneeland, M.D., from data furnished him by Signor Placido. It presented a series of remarkable mountain and forest experiences in New Zealand, the Sandwich Islands, and Japan, and bore witness to the physical courage and indomitable energy of this widely travelled Italian.

Another paper by Dr. Kneeland, entitled “A Visit to the Crater of Vesuvius at Night in April, 1882,” was read by Mr. R. F. Curtis.

Mr. Charles H. Ames read a paper entitled “The Mountains near Ktaadn Iron Works, Maine.” A large map of the region was thrown upon the screen. The group numbers thirty-one peaks, ranging in height from fifteen hundred to four thousand feet, and lies between Moosehead Lake and the west branch of the Penobscot. The interesting view from White Cap, the highest of the group, was described in detail, and the principal lakes were pointed out upon the map. Mr. Ames characterized this as the best hunting and fishing ground in New England; and exhibited, as mementos of his expedition, a beaver skin, moose antlers, and a caribou head. In closing, he expressed the hope that the Club would endeavor to perpetuate the Indian names of the region.

Mr. J. B. Henck, Jr., exhibited several varieties of oak leaves brought from Florida, and several scientific instruments purchased in London.

March 18, 1884 (Evening). — Special Meeting.

Vice-President J. B. Henck, Jr., presided. There were present about one hundred persons.

The Corresponding Secretary announced the action of the Club in reference to the relief of the sufferers at Castello, and solicited further contributions.

The entertainment of the evening was a lecture on "The Sandwich Islands," illustrated with the lantern, by Mr. George H. Barton. The lecturer at first gave a general description of the Hawaiian group, locating upon the map the different islands and the principal mountains. He spoke of the climate, vegetation, and people; gave a short account of the history of the islands, and explained the present form of government. Views of Honolulu and Hilo were shown. Diamond Head, a typical crater, was illustrated with two views. Haleakala, the crater of which is the largest in the world, was described in detail, and an interesting account was given of a night spent on the volcano. The lava streams of Mauna Loa were described, the gulches and bluffs of Hawaii were illustrated, and the lecture closed with a well-illustrated description of Kilauea, and especially of the new lake of fire, Halemaumau.

April 9, 1884. — Fifty-sixth Corporate Meeting.

President Scott in the chair.

Seventy persons were present. Twenty-eight new members were elected, and seven nominations to membership were presented. Dr. T. Sterry Hunt, of Montreal, was elected a Corresponding Member.

The Corresponding Secretary announced the receipt of intelligence of the death of Dr. Ernst Behm, of Gotha, recently elected a Corresponding Member of the Club. Professors Niles, Pickering, and Fay, and the Recording Secretary were appointed a Committee to draft resolutions in view of this loss.

A letter from the Vice-President of the Italian Alpine Club was read, conveying information of the death of the President of the Club, — Signor Quintino Sella, — and of the honors decreed to his memory by the Directors of the Club. The following resolution, presented by Mr. J. B. Henck, Jr., was adopted:—

"Whereas the Appalachian Mountain Club has heard with profound regret of the death of Signor Quintino Sella, the distinguished statesman and President of the Italian Alpine Club, of which important instrumentality in the development of the strength, courage, and patriotism of the youth of his native land, he was the founder:

"*Resolved*, That we extend to the members of the Italian Alpine Club this fraternal expression of our sympathy with them, — as lovers of their country, in the inestimable loss of so enlightened a statesman; as alpinists, in the removal of one whose genius contributed to the wise direction of the counsels of their organization and the insuring of its prosperity, after he had called it into being.

"*Resolved*, That a copy of these resolutions be sent to the Italian Alpine Club, and that Mr. R. H. Budden, of Florence, be requested to represent this Club at the obsequies of the deceased at Biella on the 14th instant."

It was voted that the Corresponding Secretary communicate this request to Mr. Budden by a cable message.

Rev. W. C. Winslow reported that the sum of \$107.20 had been raised since the last regular meeting, and forwarded to the Società degli Alpini Tridrentini in aid of the sufferers at Castello.

A paper by Professor W. W. Bailey entitled "Recollections of the West Humboldt Mountains, Nevada," was read by Mr. J. Ritchie, Jr. It consisted of notes taken among these mountains while a member of the U. S. Geological Survey of the 40th Parallel, relating to the geological features of the region and its flora, as well as its natural scenery. He explored Wright's Cañon, also the Buena Vista and Coyote cañons on the eastern side of the range, and found the plants quite different from those on the western side.

Rev. Luther Farnham read a paper entitled "Three Visits to the White Mountains, in 1837, 1862, and 1883," which was of especial interest as noting the remarkable changes in the intervals as regards the resort to this region and the facilities afforded to tourists.

Mr. Rosewell B. Lawrence spoke of the recent explorations in the Southern Alps of New Zealand, reading extracts from a paper by Rev. W. S. Green in the Proceedings of the Royal Geographical Society for February, 1884. With the help of large maps, sketched for the purpose, he traced the routes taken by Dr. Haast, Mr. Green, and Van Lendenfeld in their explorations of Mt. Cook and the Tasman Glacier. Some of the important results of Mr. W. W. Graham's explorations in the Himalayas last autumn were also mentioned.

April 17, 1884 (Evening). — Special Meeting.

About one hundred and fifty persons were present. Mr. Rosewell B. Lawrence presented a second time, by request, his paper entitled "Two Weeks in Norway," read in March, 1883.

Officers for 1884.*President.*

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Vice-President.

JOHN B. HENCK, JR., 15 St. James Avenue, Boston.

Recording Secretary.

ROSEWELL B. LAWRENCE, 23 Court Street, Boston.

Corresponding Secretary.

Prof. CHARLES E. FAY, Tufts College, College Hill.

Treasurer.

CHARLES W. KENNARD, 30 Chestnut Street, Boston.

*Councillors.**Natural History*, Prof. CHAS. E. HAMLIN, Museum of Comparative Zoölogy, Cambridge.*Topography*, J. RAYNER EDMANDS, Harvard College Observatory, Cambridge.*Art*, Rev. JOHN WORCESTER, Newtonville.*Exploration*, EUGENE B. COOK, 26 Hudson Terrace, Hoboken, N. J.*Improvements*, Dr. WILBUR B. PARKER, 28 Chestnut Street, Boston.

Members added since Jan. 1, 1884.

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Morse, Edward S., Salem, Mass.

Walker, Francis A., Boston, Mass.

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sie, N. Y. |
| | Yendell, Paul S., Boston. |

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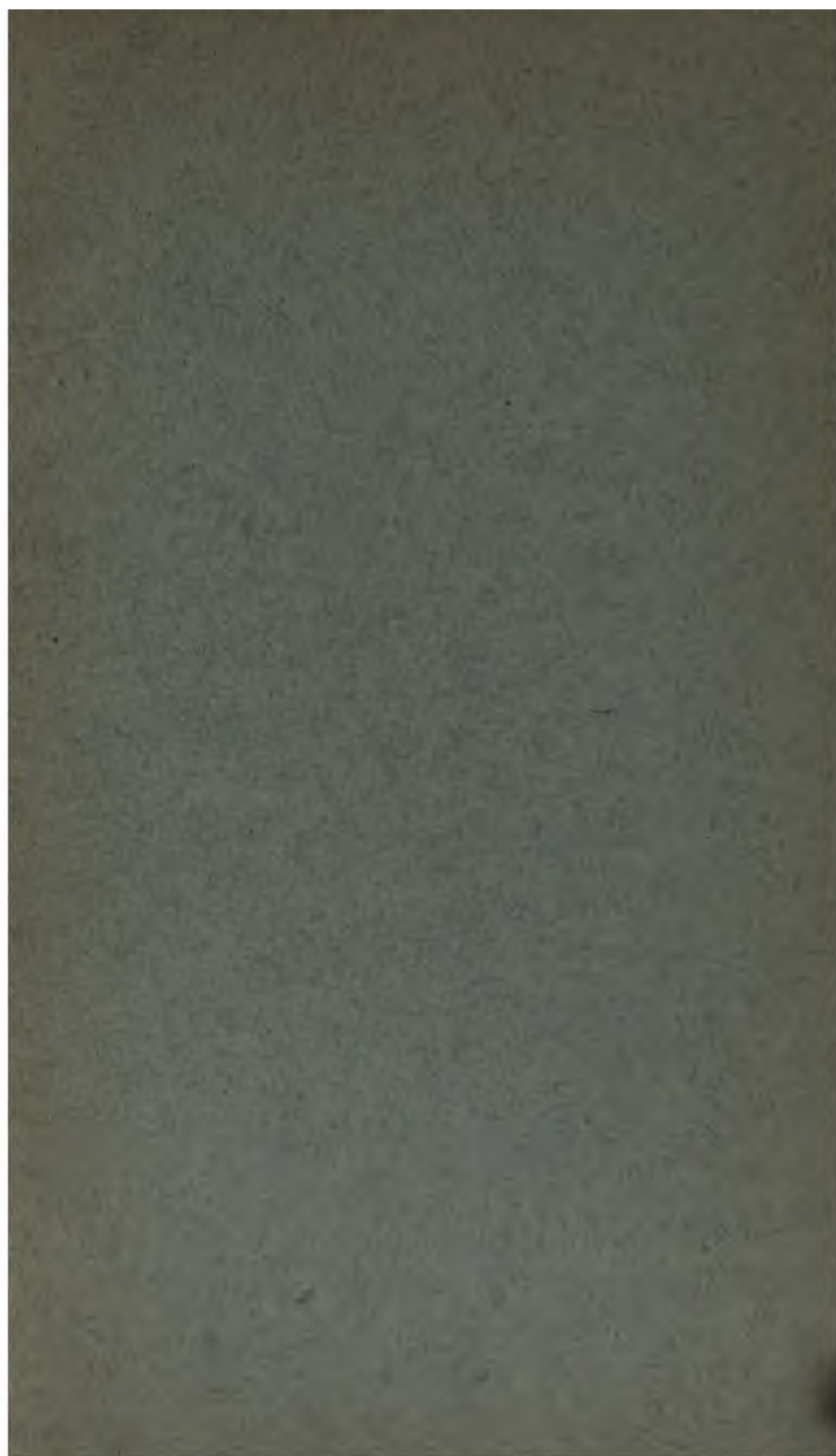
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